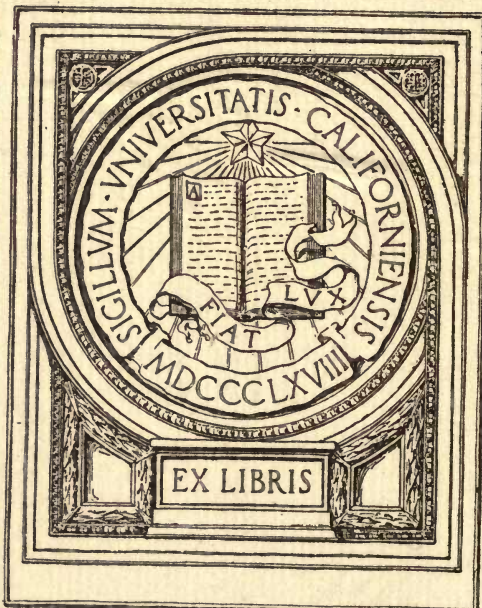


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KENTUCKY

GEOLOGICAL SURVEY

FOURTH SERIES
VOLUME THREE

PART THREE

J. B. HOEING, State Geologist.

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COALS
OF THE
NORTH FORK OF KENTUCKY RIVER
IN
PERRY AND PORTIONS OF BREATHITT AND
KNOTT COUNTIES
BY
JAMES M. HODGE

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INTRODUCTION

The following includes reports on the coals of the North Fork of Kentucky River in the counties of Perry and portions of Breathitt and Knott, and comprises results obtained in the years 1912, 1913, 1914 and 1915.

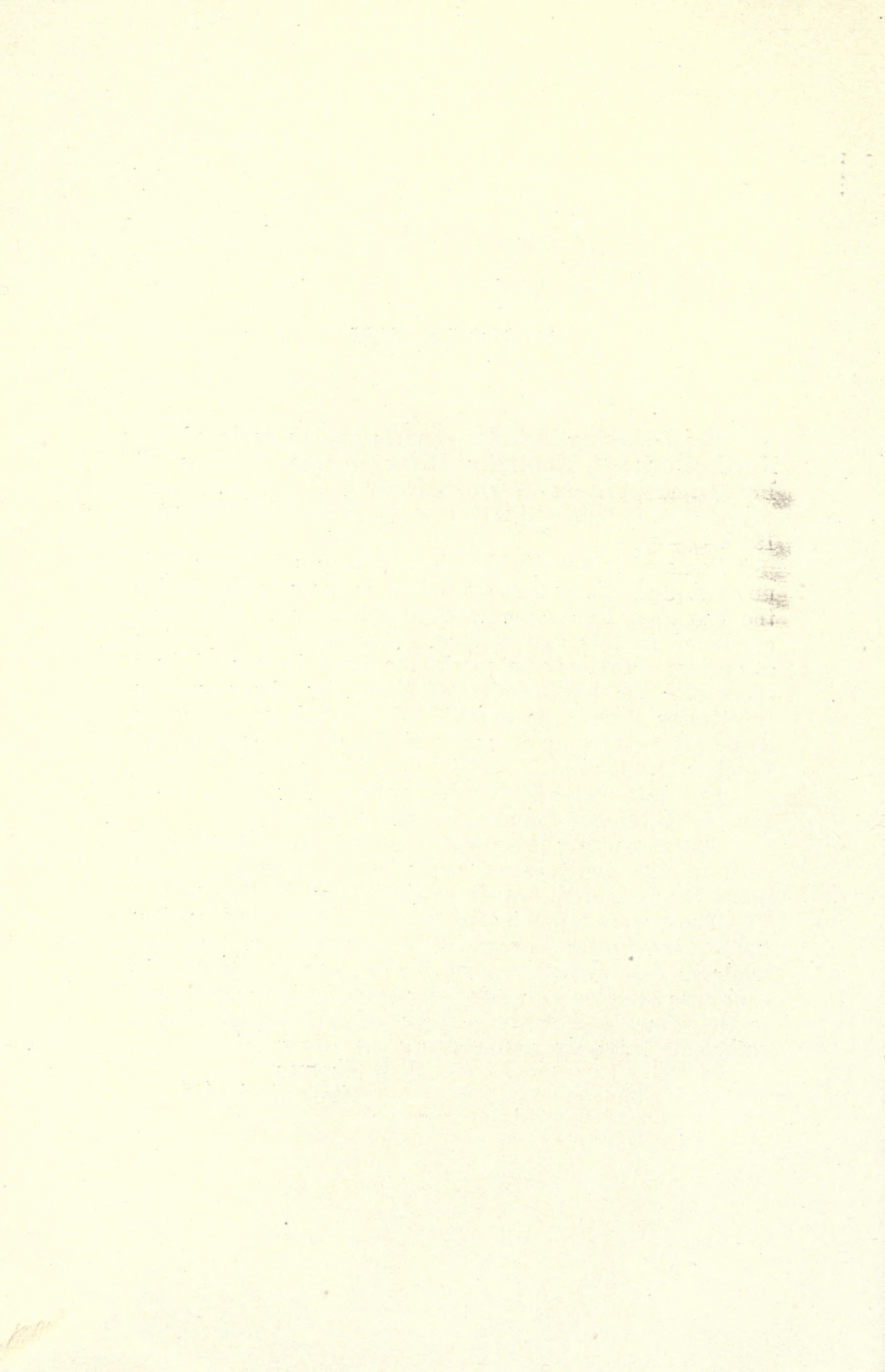
Some of this work has already been printed in Volumes I. and II., and some of it is now printed for the first time. For convenience in reference all have been combined in this one volume. The territory covered comprises Troublesome creek, the head waters of Lost creek and the North Fork of Kentucky River and its tributaries from the mouth of Campbells creek in Breathitt County up to and including Bull creek at the Letcher County line.

For data above Bull creek, reference is made to the report on Letcher County, Volume 4, Part 1.

Accompanying the present report are a number of sections and analyses of coals from operating mines along the L. and E. branch of the L. and N. Railroad.

These were taken by the Survey in co-operation with the United States Bureau of Mines and the analyses made in the laboratories of the Bureau of Mines. In each case samples were carefully taken at different points in the mines and analysis made of each sample and a composite analysis representing the whole mine.

J. B. HOEING,
State Geologist.



THE COALS OF TROUBLESOME CREEK IN BREATHITT, PERRY AND KNOTT COUNTIES.

This report follows an investigation of the drainage area of Troublesome creek, with the exception of Lost creek and its tributaries.

Recently issued topographical maps cover the whole region, and have served, with the aid of a barometer, in getting altitudes of coal openings to a close approximation, thereby enabling correlations, which without these maps would have been slow and far more difficult operations, with results far less reliable.

The general dip of the strata is northwesterly, rather more toward the north than an air line from the head of the creek to its mouth. In that distance of 27 miles the total dip is about 475 feet, or at a rate of $17\frac{1}{2}$ feet per mile.

On the upper half of the creek the greatest dip is more nearly northward and amounts to about 22 feet per mile on a line passing nearly through Hindman from Cave branch to Vest, a distance of 7 miles.

Throughout the field there are rolls and local changes of dip of little consequence except in mining, but nothing has been seen in the field of serious import for the miner, so far as dip is concerned.

The principal coal beds above drainage in the region with approximate intervals between them are as follows:

Hindman Coal
Interval 50 to 80 feet.
Francis Coal.
Interval 80 to 100 feet.
Flag Coal.
Interval 0 (?) to 80 feet.
Hazard Coal.
Interval 50 to 110 feet.
Haddix Coal.
Interval 100 feet.
Hamlin Coal.
Interval 70 to 80 feet.
Fire-clay Coal Rider.
Interval 20 to 30 feet.
Fire-clay Coal.
Interval 30 to 50 feet.
Whitesburg Coal.
Interval 120 feet.
Amburgy Coal.

All of these coals except the Hamlin coal are of workable thickness in this field, but the four highest ones alone maintain such thickness throughout large areas, unless possibly the Amburgy bed does. The Hazard bed, mined on First creek and about Hazard, is the most reliable in thickness, having ample thickness for mining over much of Perry County. The Fire-clay coal, also mined about Hazard, has good mining areas of superior coal above the flint-clay parting. Its variable thickness, however, renders it of uncertain value over extended areas. A coal higher than the Hindman was found in one place on Flint Ridge, but it can hardly be of any value at such height, even if elsewhere of considerable thickness.

HINDMAN COAL.

This bed is too high to work in this field excepting in or near the ridge between Troublesome and Quick-sand waters. It appears to be made up of three coal beds which have been opened on the head of Fugate fork, reduced to two beds on the head of Bear branch and to one on Lewis fork. Elsewhere on the continu-

ation of the dividing ridge it is not known to have been opened, and the few other openings seen in the field have all been more or less covered. The Lewis fork opening showed 8 to 10 feet of coal, with one eleven-inch and one twenty-one-inch parting, and another opening above Hindman, nearly 10 feet of coal without apparent parting.

The interval between the Hindman and Francis beds, excepting the floor of the former and roof of the latter, the thickness of neither of which has as yet been found, is occupied wholly by a massive sandstone. This sandstone, where near the hilltops, has a tendency to break off in irregular blocks, 10 to 20 feet square, and anywhere up to 40 feet in height. On Rowdy branch the sandstone is about 80 feet thick, forming miniature plateaus on the hilltops in that vicinity. Elsewhere it has been found generally about 50 feet thick.

FRANCIS COAL.

A bed has been mentioned in former Kentucky river reports as having been found 50 to 80 feet below the Hindman bed, or 100 feet above the Flag bed, but it was so rarely found and so high up as to be of little consequence, although of usually good thickness. The pitches of strata, however, bring the bed to reasonable height for working in the northwestern part of the field. The name "Francis" applied to this bed elsewhere is also used here.

Although the bed heretofore has been found nearly or quite without partings, it appears to be constant in this field, in having three or four and even five of them, making with its $2\frac{1}{2}$ to 5 feet of coal a total thickness of 4 to 10 feet. The bed is best shown, in connection with lower beds, above Vest, on Balls fork, on Trace, Pond and Sand Lick branches. Only isolated openings have been found in the field elsewhere, but their resemblance to these is manifest.

The interval between the Francis and Flag beds seems to be uniformly about 100 feet, composed mainly of sandstone, which frequently appears in cliffs.

THE FLAG COAL.

This bed usually has a sandstone roof or cliff sandstone close above it. Beginning with two partings in the bed at the mouth of Troublesome creek they are soon increased to four and retain that number up the creek to Balls fork and up it to its head. On Buckhorn creek and to some extent in isolated openings on Troublesome creek above Balls fork and on Lots creek, the lower four feet of the bed usually includes a parting of about one foot. Such regularity of section, combined with fairly frequent openings, has given correlation a degree of certainty not often attained in Eastern Kentucky except in connection with the Fire-clay coal or after elaborate investigation. This is true, notwithstanding a similar bed section of the Francis coal and in some instances of the Hazard bed close beneath.

Where the full section of this bed is uncovered the upper seams of coal are usually of poor quality, the weight of the coal evidencing a large proportion of ash, but in some instances this does not apply. The middle seams are of good coal and the lower seams generally still better. On Troublesome creek below Buckhorn, cannel occasionally appears in the lower seam, and again on Clements fork of Buckhorn creek.

The interval, mostly sandstone, between the Flag and Hazard beds, is usually somewhat under 50 feet. Opportunities for obtaining it where the two beds are found at one locality are few. Near the mouth of Troublesome creek it is about 80 feet, but it decreases to about 50 feet on Rowdy branch. On the head of Combs branch it is about 60 feet, on Coates branch, $3\frac{1}{2}$ miles northward, it is 25 feet, while across the ridge from the head of that branch, westward, toward Balls fork, less than a mile in distance, the two beds are believed to be in contact. On the head of Long fork of Buckhorn creek they are 45 feet apart. On the large area, south of Troublesome creek, above Combs branch, no opportunity was found for getting the interval.

THE HAZARD COAL.

From the mouth of Troublesome creek to near the head of Long fork of Buckhorn creek the Hazard bed varies generally in thickness of coal from 3 to 5 feet, in the latter case having one or two partings. On the head of Long fork it has over 8 feet of coal with three partings, similar to the Flag coal formerly opened above it there. On Buckhorn creek above Dan's fork it seems to be thin, the few openings made having become covered, so far as learned.

On Balls fork openings into this bed are few. On Roaring branch there is 4 feet of clean coal in it; on Big branch but 3 feet, and above Big branch still less.

On Beech branch, below Balls fork, it is opened with 8 feet of coal and two small partings. Above that creek, south of Balls fork, it holds to a usual minimum of 4 feet to above Hindman.

The coal appears to be of good quality, similar to that now mined near Hazard, and throughout most of the field the only question as to its value lies in the area which it covers. Along the main streams the coal lies near the tops of the hills, but their dividing ridges afford a large field for operations.

The interval from the Hazard to the Haddix bed consists mostly of sandstone, including possibly the Young coal, found 40 to 60 feet below the Hazard coal on Lots creek, but not discovered in the Troublesome creek field. The Hazard-Haddix interval is considerably less over much of this field than there and the Young coal is probably absent in consequence. On lower Troublesome creek the interval is probably about 100 feet, while on Rowdy branch it is only about 35 feet, but on Toms branch, $2\frac{1}{2}$ miles southeast, it is 100 feet, and on the head of Clear creek 120 feet. Elsewhere it has generally been found 60 to 80 feet, but on the head of Long Fork it is but 55 feet.

THE HADDIX COAL.

This bed usually lies close between sandstones, the upper one showing often 5 to 10 feet of smooth face and the lower one 10 to 20 feet or more.

Excepting at one opening, opposite the mouth of Riley branch, where the bed has $3\frac{1}{2}$ feet of coal with two small partings, so far as found on lower Troublesome creek, it is only about 2 feet thick. On Noble branch it attains a thickness of 33 inches of clean coal, one opening having 24 inches of it as cannel coal. From Noble branch it increases to 4 feet with two small partings on Toms branch. On Williams branch and on Georges branch of Balls fork it has some cannel coal, but is too thin to work. On Rush branch of Long fork of Buckhorn creek, on the head of Long fork and again on Hurricane and Boughcamp branches of Buckhorn creek, it has about 3 feet of clean coal. On Big and Rattlesnake branches of Balls fork and in the vicinity of Vest it is barely workable. On Pond and Sand Lick branches it carries a little cannel coal. Of the numerous other outcrops of the bed seen in this field none gave favorable promise, yet the bed is so variable in thickness and so uniformly excellent in quality, apparently, that valuable pockets of this coal may be expected yet to be discovered.

The interval from the Haddix to the Hamlin coal below the sandstone immediately under the Haddix bed is occupied mainly by alternating shales and shaly sandstones with a more massive sandstone usually over the Hamlin coal. The series is well exposed along the right forks of Combs branch, but is there much weathered to shales. The interval seems to be uniform at about 100 feet.

THE HAMLIN COAL.

This bed generally thin but useful for correlation, has $3\frac{1}{2}$ feet of coal on Hays branch. The many other places where the bed was identified are given in the following pages, but need no mention here.

The interval from the Hamlin coal to the Fire-clay coal rider is mainly of sandstone, often massive, showing often in cliffs along Troublesome creek 75 to 100 feet above it about the mouth of Rowdy creek and increasing to 175 to 200 feet about Hindman.

THE FIRE-CLAY COAL RIDER.

This bed has 37 inches of coal, of which 10 inches is cannel coal, on Barge creek, but two partings in it there destroy its present value. Though recognized frequently in the field, it approaches workable thickness again only above Big creek, near Hindman, whence it increases to a probable maximum on Perkins branch, where it has 37 inches of coal with a six-inch parting. At a number of places above Perkins branch it has induced opening, but in none of them has the bed proved favorable for working. On the head of Right fork of Troublesome creek it has a few inches of cannel coal.

The interval between the Rider and the Fire-clay coal is generally of sandstone, but sometimes is shale. It may be presumed that most of the shale, if not all of it, may give place to sandstone underground, as frequently was found to be the case on Carr's fork and elsewhere. The excessively hard sandstone found at places on Carrs fork has not been noted here.

THE FIRE-CLAY COAL.

The Fire-clay coal is about 40 feet above the mouth of Troublesome creek, 60 feet above the mouth of Barge branch: thence to the mouth of Clear creek it remains at about the same height above Troublesome creek. From Clear creek to Trace fork of Right fork above Hindman, the height above stream gradually increases to about 170 feet. Beyond that, though the bed still rises, the stream bed rises faster and the two meet at the head of the fork above Mallie postoffice. The bed also goes below drainage near the head of Right fork. On Balls fork it goes under, probably near Laurel creek, about 2 miles below Vest.

The first conclusive evidence for correlation of the bed was found in an outcrop at the roadside, 45 feet above the creek, one mile above Rowdy branch, where the flint fire-clay, 4 inches thick, lies upon a foot of coal. Though with this aid the bed was identified in many places, there were no outcrops found on Troublesome creek waters (not including Lost creek) below Big

creek, near Hindman, where the bed gave any promise of attaining workable thickness. On Montgomery branch it begins to show a better condition and on Big branch has 28 inches of coal on flint fire-clay. A quarter of a mile above Big branch is 33 inches of coal, probably of this bed, but frequent openings farther up the creek and Right fork to Perkins branch give only 2 to $2\frac{1}{2}$ feet of coal. On Perkins and Cave branches the coal is 3 to $3\frac{1}{2}$ feet thick and with a flint fire-clay parting; between Parks and Trace branches, 39 inches with one-inch soft clay parting; on Trace branch, 36 inches with four-inch flint-clay parting; on Saw-pit branch, 38 inches clean coal. A few openings farther up Right fork gave but 2 to $2\frac{1}{2}$ feet of coal.

On the left fork near its head the bed has been mined to some extent with 41 inches of coal which in appearance is fully equal to that mined at Hazard, and, lying at the foot of the hill here, its value is assured as far as the coal holds its thickness.

The interval between the Fire-clay coal and the Whitesburg is occupied almost wholly by one massive sandstone, seen entire in the cliff at the mouth of Combs branch, and much of it in view along the creek from Noble branch to Clear creek.

THE WHITESBURG BED.

According to the nomenclature adopted here, the Whitesburg bed includes three or four seams of coal scattered through perhaps 50 feet of strata, the upper seam being 50 feet below the Fire-clay coal. Little attempt was made to distinguish the several seams, but besides the thick sandstone over the upper one, it is apt to have a foot or more of black slate roof, with occasionally black slate found upon another seam also. In general the bed is not thick enough to work, though two seams, at least, have as much as three feet of coal in places, but not of the best quality. Entries along Troublesome creek most conveniently situated for local use are all abandoned in favor of the better and thicker coals found high on the hills. The coal in these entries is about 3 feet thick usually, but varies from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet. Toward the head of Right fork, where the Hazard bed overtops

the hills, the low coals are more in demand, hence the frequency of openings in them. On Buckhorn creek and Balls fork no entries into the bed have been made.

The intervals between the seams of coal are mostly of sandstone, the quarries about Hindman being between the second and third, probably.

Below the Whitesburg coals is an alternation of laminated and shaly sandstone, showing much shale along the road above Hindman on Right fork, and then massive sandstone again down to the Amburgy bed.

The Amburgy bed is above drainage only on Right fork, above Hindman, and there only for about 3 miles close to stream level. The coal at the only place where it was seen is 35 inches thick.

The following detailed description of coal openings and outcrops and pertinent matter is designed to give as full information of the field as present development and the means employed permit. They suffice to show not only a large and valuable coal field, but, in conjunction with the topographical maps, what parts of the field are most desirable for early development, with this reservation, that where inhabitants are few the coal beds are least developed.

In giving details measurement in inches are exact unless otherwise stated; those given in feet are approximate only. Distances given in yards are by estimation, given in miles they are so obtained from maps or by report or estimation. Owing to the longer distances up the main streams in their mapped meanders than by the road the distances as given from their mouths for up stream are greater than those usually stated as by the roads, but for points not far apart there should be agreement.

This investigation was made with the assistance of Mr. Charles E. Straub, of the Survey, and the more important openings of his measurement are designated by the letter S; the correlations are wholly by the writer.

TROUBLESOME CREEK

The Haddix coal, formerly worked in the Hargis mine, opposite the mouth of Troublesome creek, has there a thickness of about 4 feet, of which the lower 3 feet is cannel coal, as measured on its early developments. It lies at altitude 975 and is 240 feet above the river there.

The Flag coal was found with 39 inches of coal and partings of 2 and 4 inches, at altitude 1,135.

The Fire-clay coal should lie at or slightly above the level of the railroad, or about at altitude 775, and the Hazard coal at altitude 1,075.

On the right of a left hollow, $1\frac{1}{4}$ miles up Troublesome creek, a long entry gives the following bed section, 3 yards in:

Flag Coal.

Sandstone	4	ft.
Shale	$1\frac{1}{2}$	ft.
Coal	23	"
Shale	5	"
Coal	18	"
Altitude, 1115.		
Altitude of river, 735.		

In the middle of the upper seam of coal is 6 inches of poor coal, heavy in ash. The lower seam is a hard block, with vertical seams containing clay like cannel coal. Coal in the dump exhales in the hot sun a strong odor of sulphur, but none was visible in the coal seam. With only about 100 feet of covering here the area of the bed is small. Benches at altitudes 980 and 860 indicate approximately the location of the Haddix and Hamlin beds. Another midway between them has probably no significance.

At the mouth of Lost creek, altitude 735, are 20 feet of dark shales containing large lime concretions. The shales are prominent for several miles up Lost creek and lie between the Whitesburg and Fire-clay coals.

On a left branch of Lost creek, at its mouth, on the right, one-fourth mile up the branch, Walter Strong has an eight-yard entry giving the following bed section at its face:

Flag Coal.

Shale.	
Coal	12"
Clay	2"
Coal	7"
Shale	4"
Coal	23"
Altitude, 1135.	

Comparison of this with the preceding section shows similarity by exclusion of the two-inch clay parting.

HAYES BRANCH.

On the left, $2\frac{1}{2}$ miles up Troublesome creek. Altitude of mouth, 735.

At the mouth of a right branch, three-fourths mile up, is 12 inches of coal under 2 feet of shale and 20 feet of laminated sandstone. This appears to be of the Fire-clay coal bed, at altitude 830.

A thin coal stain in the road one mile up then represents the rider, at altitude 865.

On the left, one mile up, Judge Taulbee has an opening into the Hamlin bed with 43 inches of coal under 10 feet of shale. Sandstone is exposed under the thin clay floor. The altitude of the bed is 945.

HALF-WAY BRANCH.

On the left, $3\frac{3}{8}$ miles up. Altitude of mouth, 740.

On top of the cliff sandstone near the mouth of this branch, at altitude 835, is a thin coal, probably the Fire-clay coal, another thin seam, the rider, showing at altitude 850, with 15 feet of shaly sandstone between them.

A broad bench, one-half mile up the branch, at altitude 1,010, is 30 feet, more or less, below the Hazard coal, as frequently is the case on Troublesome creek.

On the left, five-eighths mile up the branch, the Davis entry gives the following section:

Flag Coal.

Sandstone	20 ft.
Coal	1"
Shale	2"
Coal	19"
Clay	22"
Coal	15"
Shale	11"
Coal	20"
Altitude, 1110.	

The lowest seam of coal, as usual with this bed on Troublesome creek, is a block coal on a few inches of soft coal (4 inches here) at the bottom.

On the right, 6 miles up the creek, I. B. Combs has an entry with the following bed section:

Haddix Coal.

Sandstone	5 ft.
Coal	26"
Clay	2"
Coal	2"
Clay	3"
Coal	13"
Altitude, 1015.	

RILEY BRANCH.

On the left, 6 miles up Troublesome creek. Altitude of mouth, 745.

On the right, 1 $\frac{1}{4}$ miles up, at Clay Hole postoffice, is the following, probably of the Fire-clay coal bed:

Shale	2 ft.
Coal	19"
Shale	3"
Coal	?
Altitude, 865.	

The partly covered prospect showed a foot of coal in the bottom seam, with perhaps 6 inches more not seen.

At the branch, $1\frac{1}{2}$ miles up, is the following section:

Shale	8 ft.
Black slate	1 ft.
Coal	12"
Clay	12"
Coal	6"
Shale	8 ft.
Coal in branch.	
Altitude, 830.	

This is probably again of the Fire-clay coal.

At the branch, $1\frac{3}{4}$ miles up, is the following:

Sandstone	6 ft.
Coal	12"
Clay	6"
Sandstone	2 ft.
Altitude, 865.	

A thin coal stain shows also 15 feet above the foot of coal, which probably represents the Fire-clay coal rider.

On the right, $2\frac{1}{4}$ miles up, at the mouth of a three-yard entry, is the following:

Flag Coal.

Sandstone	5 ft.
Shale	4 ft.
Coal	23"
Clay	4"
Coal	15"
Shale	15"
Cannel coal	13"
Altitude, 1105.	

The lower parting contains a little coal and the bottom 4 inches of the cannel was not seen.

BARGE CREEK.

On the right $6\frac{1}{2}$ miles up Troublesome creek. Altitude of mouth, 745.

On a left branch one-fourth mile up the creek, in a

right drain at its head, a closed prospect gives evidence of a coal bed about 6 feet thick with cannel coal at the bottom. It is covered by 8 feet of shale and 35 feet above it is a sixty-foot tower cliff. It is of the Flag bed at altitude 1,145 (S.)

RIGHT FORK.

One-half mile up Barge creek. On the left one-eighth mile up the fork, 10 feet above it, a ten-yard entry gives the following, the two coal seams being measured at the face:

Whitesburg Coal.

Shale	1½ ft.
Coal	4"
Shale	3"
Coal	23"
Shale	5"
Coal	1"
Clay.	
Altitude, 790.	

On the left of the fork, one-half mile up it, Mr. Straub obtained the following:

Fire-clay Coal Rider.

Shale	10 ft.
Sandstone	7"
Shale	3"
Coal	19"
Clay	2"
Coal	8"
Shale	9"
Cannel coal	10"
Altitude, 880 (S.)	

On the right, 7 to 7¼ miles up Troublesome creek, are the George Coleman entries, now closed, of which the first one opened gave 30 inches of coal with three partings amounting to 8 inches, and a roof of bituminous shale. The bed is the Whitesburg, at altitude 790.

LEWIS BRANCH.

On the left, $7\frac{5}{8}$ miles up Troublesome creek. Altitude of mouth, 750.

Ten inches of coal, under 4 feet of shale, one-fourth mile up the branch, probably represents a part only of the Fire-clay coal at altitude 800.

At a rock house on the right, three-eighths mile up, is the following:

Hazard Coal.

Massive sandstone	40 ft.
Shaly sandstone	4 ft.
Coal	6"
Shale	3"
Coal	10"
Shale	2"
Coal	4"
Clay	2 ft.
Laminated sandstone.	
Altitude, 1040.	

A foot of coal under massive sandstone at a spring five-eighths mile up the branch is of the Hamlin bed at altitude 975.

On the right at the head of the branch, three-fourths mile up, J. M. Allen has a ten-yard entry with the following bed section at its face:

Flag Coal.

Sandstone	20 ft.
Shale	$1\frac{1}{2}$ ft.
Coal	13"
Shale	1"
Coal	6"
Shale	4"
Coal	16"
Shale	14"
Coal	15"
Altitude, 1110 (S.)	

RUSSELL BRANCH.

On the left, 8 miles up Troublesome creek. Altitude of mouth, 755.

On the right at the mouth of the branch is an abandoned entry with $2\frac{1}{2}$ feet of clean coal, evidently the main seam of the Whitesburg bed, at altitude 790.

Thirty feet under this is 10 inches more coal with two partings, each 2 inches thick, a split, probably, from the main seam.

On the left of a right branch, one-fourth mile up Russell branch, one-eighth mile up the right branch, is the following:

Whitesburg Coal.

Sandstone	25 ft.
Black slate	4 ft.
Thin coal.	
Shale	5 ft.
Sandstone	10 ft.
Altitude, 795.	

This seems to be of the main seam of the Whitesburg bed and indicates the cause of the abandonment of the entry at the mouth of Russell branch.

On the right of the same right branch, one-fourth mile up and in it, is 9 inches of coal, at altitude 835, under 40 feet of shale and shaly sandstone containing thin coals. These coals probably are of the Fire-clay coal bed and its rider.

On the left of the same branch, one-half mile up it, the Fire-clay coal or its rider, under 5 feet of shale has 17 inches of coal with 15 inches of sandstone and shale parting, at altitude 860.

Again on the left, three-fourths mile up the branch, a prospect gives the following:

Haddix Coal.

Shale.	
Coal	16"
Shale (with coal)	13"
Cannel coal	9"
Coal	8"
Shale (thin).	
Coal	3"
Altitude, 1090. (S.)	

On the right, three-fourths mile up, at the face of a six-yard entry, the Hamlin bed gives 20 inches of coal under 3 feet of laminated sandstone at altitude 945. Fifteen feet below is 12 inches of coal under 3 feet of sandstone and a foot above sandstone.

ANDY BRANCH.

On the left, seven-eighths mile up Russell branch. Altitude of mouth, 825.

In this branch, one-half mile up it, is 7 inches of coal under $11\frac{1}{2}$ feet of shale at altitude 890, apparently of the same seam as that last given.

On a left branch, one-half mile up, on its left fork, one-fourth mile up it, and on the left of the fork, one-eighth mile up the latter, the Goff heirs have a prospect showing the following:

Flag Coal.

Sandstone	3 ft.
Coal	16"
Clay	$\frac{1}{2}$ "
Coal	5"
Shale	4"
Coal	14"
Shale	12"
Cannel coal	11"
Altitude, 1135.	

On a right branch, $1\frac{1}{8}$ miles up Russell branch, on the right of a right drain one-fourth mile up the branch, the Goff heirs have, at the face of a two-yard entry:

Flag Coal.

Sandstone	3 ft.
Coal	17"
Bituminous shale	7"
Coal	12"
Shale	18"
Cannel coal	(?)
Altitude, 1140.	

The upper seam of coal has 2 inches of bone 12 inches from the top. The bottom of the bed was not found.

The following sections, taken on an early exploration as of the Flag coal, from an opening on A. C. Russell's land and both probably from the left fork of Russell branch, are given following. Developments since that time enable a correction of the correlation then assumed:

Flag Coal.

Slate	2"
Coal	20"
Shale	4"
Coal	16"
Shale	9"
Coal	6"
Shale	3"
Coal	16"

Altitude, 1115.

Hindman Coal.

Coal	16"
Shale	1"
Coal	34"
Sandstone	1"
Coal	12"

Altitude, 1275.

Analyses by Dr. R. Peter of my samples from these outcrop openings follow, but as each sample showed weathering and must have included extraneous matter, they, and especially No. 2531, should not be regarded as accurately representing the quality of the coals.

Analyses.

	Flag.*	Hindman.
Chemical report No.	2,530	2,531
Moisture	3.80	4.20
Volatile combustible matter	35.60	32.40
Fixed carbon	54.80	52.26
Ash	5.80	11.14
	100.00	100.00
Sulphur	0.875	0.848
Specific gravity	1.345	1.426
Coke (dense)	60.60	63.40
Color of ash	Salmon	Very light grey

No. 2530—"In rather thin, irregular laminae, with ferruginous stains on some exterior surfaces."

No. 2531—"Seems to be splint coal."

RIGHT FORK.

On the right, $1\frac{3}{4}$ miles up Russell branch.

On the right, one-fourth mile up the fork, a one-yard entry gives the following bed section:

Flag Coal.

Sandy shale	5 ft.
Coal	16"
Shale	3"
Block coal	13"
Bottom not found.	
Altitude, 1145.	

An inch of bone coal is in the upper seam 9 inches from the top. Probably the floor is a parting with more coal underneath.

At the former James Rhollev house and spring, one-half mile up this fork, the Haddix coal varies in thickness in a distance of 100 yards from 1 inch to 22 inches. Its altitude is 1,035. Though some prospecting in recent years has been attempted on the Flag bed, this attractive fine bright splint coal seems to have been neglected.

On the right, three-fourths mile up the fork, Elisha Miller has a twenty-yard entry into what is probably an

upper split of the Hindman bed with the following bed section at the face of the entry:

Shale	15 ft.
Coal	32"
Shale	3"
Coal	24"
Altitude, 1320.	

Although nearly 600 feet above Troublesome creek this bed gives a moderate workable area in Flint ridge, the top of the ridge at the head of Russell branch being 180 feet higher.

A flint bed 30 feet thick lies at altitude 1,450 and extends for several miles along the ridge. The hills are not high enough to catch this flint elsewhere in Eastern Kentucky excepting on the Black mountains; in them it appears to be absent.

MILLER'S BRANCH.

On the left, $8\frac{3}{4}$ miles up Troublesome creek. Altitude of mouth, 755.

On the left at the mouth of this branch the following section is exposed:

Whitesburg Bed.

Sandstone	20 ft.
Black slate	3 ft.
Coal	4"
Shale	2"
Coal	6"
Coal and clay	6"
Covered	2 ft.
Sandstone	15 ft.
Altitude, 785.	

On the right, one-eighth mile up, 11 inches of coal shows, with 2 inches parting, at altitude 785.

On a left branch, three-eighths mile up, on the left one-fourth mile up the branch, John E. Miller has a twelve-yard entry, which gives the following bed section at its face:

Flag Coal.

Shaly sandstone.	
Coal	17"
Shale	1"
Coal	4"
Shale	5"
Coal	16"
Bituminous shale	13"
Black slate	8"
Block coal	13"
Altitude, 1110.	

A fifteen-foot cliff shows 30 feet above the entry and a forty-foot cliff 70 feet above it. A broad bench at altitude 945 indicates the level of the Young coal.

In Miller's branch under a small waterfall, three-fourths mile up, is 4 inches of coal under a foot of black slate and then 2 feet of shaly sandstone at altitude 860. This appears to be the level of the rider to the Fire-clay coal, but the black slate grades from common at the top down to black jack—almost a heavy coal—with little cleavage at the bottom, and it is probable that this is a variation of the flint-clay parting of the latter bed. The following coal also leads to such conclusion.

On the right at the mouth of Bear branch, 1 mile up, is the following, the coal at stream level:

Rider Coal.

Shale	30 ft.
Coal	7"
Shale	2"
Coal	3"
Shale	17"
Coal	9"
Altitude, 890.	

The covering shale of this coal probably continues to the next coal above, some 60 feet higher. The coal is found in the branch, $1\frac{3}{8}$ miles up, with the following section:

Yellow shale	30 ft.
Covered	20 ft.
Black slate in square blocks	1 ft.
Dark shale	2 ft.
Coal (altitude, 950)	2"
Black slate	2"
Dark shale	20 ft.

On the left, $1\frac{3}{4}$ miles up the branch, the Haddix bed shows 27 inches thick, partly splint coal, at altitude 1,000. Over it is 10 feet of sandstone and 3 feet under it is 3 feet of sandstone, below which begins the shale series just noted. This shows a remarkable diminution of thickness of sandstone under the Haddix bed, where it is generally conspicuous, and may account for an apparent interval down to the Fire-clay coal of about 150 feet instead of 200.

On the right, at the branch, 2 miles up it, at altitude 990, and again $2\frac{1}{8}$ miles up, at altitude 1,010, are exposures from which the following is derived, indicating a split of the Haddix bed:

Hard sandstone	5 ft.
Coal	13"
Shale	1 ft.
Covered (estimated)	1 ft.
Shale	3 ft.
Sandstone	2 ft.
Shaly sandstone	8 ft.
Coal	8"
Black slate	8"
Shale	7"
Coal	6"

In the branch, $2\frac{1}{2}$ miles up, is 10 inches of coal under 10 feet of shale and then 10 feet of sandstone, apparently of the Young bed, at altitude 1,060.

In a right branch, $2\frac{3}{4}$ miles up, on the left, one-eighth mile up the right branch, A. Raleigh has a ten-yard entry with the following section at its face:

Flag Coal.

Sandstone.	
Shale	3"
Coal	12"
Clay	1"
Coal	8"
Shale	3"
Coal	16"
Bituminous shale	18"
Block coal	12"
Altitude, 1100.	

On the right, $8\frac{7}{8}$ miles up Troublesome creek, Robert Fugate has a six-yard entry, with bed section, measured at its mouth, as follows:

Flag Coal.

Sandstone	2 ft.
Coal	11"
Shale	6"
Coal	11"
Bituminous shale	13"
Coal (not seen)	18"
Altitude, 1085.	

On the left, $9\frac{1}{2}$ miles up, J. B. Noble has a twelve-yard entry, with the following bed section at its face:

Flag Coal.

Sandstone	30 ft.
Shale	1½ ft.
Coal	18"
Shale	1"
Coal	3"
Shale	5"
Coal	13"
Shale	14"
Coal	12"
Altitude, 1150. (S.)	

Coal showing at old prospects under this entry at altitudes 805 and 905, presumably of the Fire-clay coal and of the Hamlin bed, indicate that altitude obtained of

the entry is 40 to 50 feet too high, and so actually conforms with others obtained of the bed in this region.

On the left, $9\frac{3}{8}$ miles up the creek, an opening gives the following section:

Hamlin Coal.

Shaly sandstone	8	ft.
Shale	$1\frac{1}{2}$	ft.
Coal	18	"
Clay	1	"
Coal	2	"
Altitude, 945. (S.)		

CANEY CREEK.

On the right, $9\frac{5}{8}$ miles up Troublesome creek. Altitude of mouth, 760.

On the right of a right branch, five-eighths mile up Caney Creek, one-fourth mile up the branch, is the following:

Flag Coal.

Shale	4	ft.
Coal	9	"
Shale	1	"
Coal	6	"
Shale and coal	5	"
Coal	10	"
Shale	6	"
Coal	14	"
Shale	11	"
Coal	18	"
Altitude, 1255? (S.)		

This bed section corresponds so closely with others of the Flag bed in this vicinity that the correlation can hardly be questioned, but a rise of the bed to such height is improbable. A barometer error of about 100 feet is likely. The bed may be the Francis, however, which has a similar section on Balls fork above Vest.

RIGHT FORK.

On the right, three-fourths mile up Caney creek.

On the right, one-eighth mile up this fork, the Fire-clay coal (or its rider) has 12 inches of coal, the lower half cannel coal, separated from the upper by a thin clay seam. It is under 10 feet of sandstone and at altitude 870 (S). Below this is 7 inches of coal, under 4 feet of shale and 10 feet of sandstone at altitude 835.

On the left, one-half mile up Right fork, is the following section of the Fire-clay coal (or its rider):

Fire-clay Coal (Rider).

Shale.

Coal and shale 8"

Shale (about) 12"

Coal 10"

Thin shale.

Cannel coal 5"

Shale 3"

Coal 8"

Altitude, 865. (S.)

The right fork forks one-half mile up and at altitude 920.

Thence, one-half mile up the left fork and on the left is 28 inches of coal under 10 feet of shale of the Haddix bed at altitude 1,060 (S.)

On the right, 10 $\frac{3}{4}$ miles up Troublesome creek, William Ellis has an eight-yard entry with the following section at its mouth:

Flag Coal.

Shale 3 ft.

Coal 24"

Shale 3"

Coal 16"

Shale 13"

Coal (about) 11"

Altitude, 1110.

On the left, 11 miles up the creek, the Whitesburg bed shows 4 inches of coal (with possibly more under a four-inch shale parting) under $1\frac{1}{2}$ feet of shale and 10 feet of sandstone. Its altitude is 795.

In a left drain, $11\frac{1}{4}$ miles up the creek, what appears to be the Fire-clay coal is 10 inches thick, not including a parting of 4 inches. It lies under 8 feet of shale at altitude 845.

On the right of the drain, one-fourth mile up it, Taulbert Campbell has a fifteen-yard entry with bed section at its face as follows:

Flag Coal.

Shaly sandstone	1 ft.
Coal	11"
Shale	1"
Coal	10"
Shale	5"
Coal	14"
Bituminous shale	12"
Cannel coal	11"
Coal	7"
Altitude, 1120.	

Near the mouth of Fugate fork, Mr. Moore formerly examined on the Roberts farm an opening into the Flag bed, with section as follows:

Flag Coal.

Coal	22"
Shale	3"
Coal	17"
Shale	10"
Cannel coal	22"

Mr. Moore's samples of the three seams of the bed, analyzed by Dr. R. Peter for the Survey, gave the following results: It is inferred that the top seam, with its high ash, was sampled from a very muddy outcrop. None of the coal could have been taken from far underground. The bottom seam shows remarkably well, though, according to Dr. Peter, not all cannel coal.

	Top.	Middle.	Bottom Cannel.
Chemical Report No.....	1702	1704	1703
Moisture	3.30	2.20	3.40
Volatile combustible matter..	31.44	39.20	43.40
Fixed carbon	49.76	51.14	46.96
Ash	15.50	7.46	6.24
	100.00	100.00	100.00
Sulphur	0.991	2.525	0.630
Specific gravity	1.405	1.290	1.280
Coke.....	65.26	58.60	53.20
	Dense friable	Spongy	Friable
Color of ash	Pinkish gray	Lilac gray	Buff gray

No. 1702—"A splint coal splitting into very thin laminae, with fibrous coal between, but with no appearance of pyrites. The sample has a weathered and tarnished appearance, showing ferruginous and earthy stains."

No. 1704—"Rather a dull-looking coal, apparently pretty pure, having but little apparent fibrous coal or pyrites between its laminae. Exterior of some of the lumps covered with ferruginous incrustations."

No. 1703—"Called cannel. A pure-looking coal with but little fibrous coal and no apparent pyrites. Sample somewhat mixed in character. Some pieces of cannel coal; others splint coal; others apparently shaly."

FUGATE FORK.

On the left, $11\frac{3}{8}$ miles up Troublesome creek. Altitude of mouth, 765.

On the right, at the fork, one-fourth mile up it, the Whitesburg bed shows thin under 2 feet of black slate and 20 feet of sandstone at altitude 780.

On the right, three-eighths mile up, a prospect gives 24 inches of coal under 10 feet of sandstone and directly on bituminous sandstone. The lower 4 inches of the bed is a tough bone coal. At altitude 990 this is probably of the Haddix bed.

On a left branch, one-fourth mile up, on the left one-fourth mile up the branch, Isaac Miller has a twelve-yard entry with the following section at its mouth:

Flag Coal.

Shale	8 ft.
Coal	11"
Shale	1"
Coal	8"
Shale	5"
Coal	13"
Shale	13"
Cannel coal	15"
Altitude, 1125.	

At altitude 1,145, or about 10 feet above the shale exposed at the opening, is a twenty-five-foot cliff. At altitude 1,225 an uprooted tree shows a portion of the Francis coal and on top of the spur at this level is a slight outcrop of iron ore.

On a left branch, three-eighths mile up, on the left one-fourth mile up the branch, Henry Hudson has a seven-yard entry with section following, the fourteen-inch seam and those below measured at its face, higher strata not having been mined:

Flag Coal.

Shale.	
Coal	12"
Shale	1"
Coal	7"
Shale	4"
Coal	14"
Shale	12"
Black slate	2"
Cannel coal	12"
Coal (about)	3"
Altitude, 1120.	

On the left, three-fourths mile up the fork, is 5 inches of coal under black shale, at altitude 815, slightly under the level of the Fire-clay coal.

On the left, $1\frac{1}{8}$ miles up, is 11 inches of coal under 8 feet of laminated sandstone, at altitude 845, the Fire-clay coal or its rider. The bench of the Hamlin coal is distinct at altitude 935.

Above this outcrop Jackson Miller has a six-yard entry with coal at the face still soft from weathering, but giving the following section clearly:

Flag Coal.

Sandstone	5 ft.
Coal	11"
Clay	1"
Coal	8"
Bituminous shale	5"
Coal	16"
Shale	12"
Black slate	2"
Cannel coal	11"
Coal	3"
Altitude, 1160.	

The base of a ten-foot cliff over the entry is at altitude about 1,190.

Across Fugate fork from this entry is an abandoned one at altitude 1,140, reported of about the same section. Its altitude is probably about correct for the preceding entry.

On the right, $1\frac{1}{2}$ miles up, is a thin coal at the fork, probably the rider, at altitude 875. Exposed above this coal are 30 feet of shale and about an equal amount crops out from under it along the fork farther down.

LAUREL FORK.

On the right, $1\frac{3}{4}$ miles up Fugate fork. Altitude of mouth, 905.

On the right, one-fourth mile up this fork, Thomas Ellis has a six-yard entry with the following bed section at its mouth:

Flag Coal.

Shaly sandstone	30 ft.
Coal	12"
Shale	2"
Coal	7"
Bituminous shale	4"
Coal	17"
Bituminous shale	12"
Coal	3"
Cannel coal	9"
Coal	8"
Altitude, 1145.	

The exposure over the coal is not natural, but was made to keep the mouth of the entry clear.

On the right, $\frac{1}{2}$ mile up, at a spring near stream level is 16 inches of coal under 4 feet of massive sandstone, at altitude, 1,005. It appears likely that this is of the Haddix bed, with increased interval to the Flag bed, as given in the next section, or the apparent increase may be due to a roll of strata or to the inaccuracy of barometric measurement.

On the right, three-fourths mile up, Isaac Miller has a five-yard entry with the following bed section half way in it:

Flag Coal.

Shaly sandstone	3 ft.
Coal	12"
Shale	2"
Coal	7"
Bituminous shale	7"
Coal	17"
Bituminous shale	10"
Coal	7"
Black slate	5"
Coal	10"
Altitude, 1155.	

LEFT FORK.

On the left, $1\frac{3}{4}$ miles up Fugate fork. Altitude of mouth, 905.

In the fork, one-eighth mile up it, a thin coal under 3 feet of black slate, at altitude 915, is probably of the Hamlin bed.

On the right, five-eighths mile up, Isaac Miller has a six-yard entry, giving 2 yards in, the following bed section:

Flag Coal.

Sandstone	15 ft.
Coal	11"
Shale	1"
Coal	7"
Bituminous shale	4"
Coal	13"
Bone coal	2"
Black shale & slate	18"
Cannel coal	12"
Altitude, 1135.	

The 18 inches of upper coal is rich in bitumen, unlike much of the top coal of this bed; the middle 13 inches is reported especially good; the bottom of the cannel coal was not seen and the 12 inches measured may include a few inches of bituminous coal.

On the right of a right branch, three-fourths mile up Left fork and with mouth at altitude 1,005, on the right, one eighth mile up the branch, Isaac Miller has a four-yard entry with the following section at its face:

Flag Coal.

Sandstone.	
Coal	12"
Shale	3"
Coal	5"
Bituminous shale	5"
Coal	15"
Bituminous shale	16"
Cannel coal	11"
Coal	4"
Altitude, 1155.	

On the right three-eighths mile up the branch, is another opening into the same bed, under 10 feet of shale, at altitude 1,130. The total thickness is 68 inches, of which the upper 3½ feet is virtually identical with the preceding and the remainder was felt with a hammer, but not seen, is similar to the rest of that section.

In the left fork, seven-eighths mile up, is 10 inches of coal of the Haddix bed under 10 feet each of shale and laminated sandstone, and at altitude 1,040.

On the right, by the road, $1\frac{1}{4}$ miles up, a covered opening into the Flag bed gives its altitude as 1,135.

On the right of the gap at the head of the fork and 15 feet higher than the gap, on a broad bench, an entry, now closed, formerly gave the following bed section, well under cover, a long entry having been made in getting coal for local use:

Hindman Coal.

Sandstone.	
Shale	5 ft.
Coal	4"
Shale	1"
Coal	14"
Shale	2"
Coal	10"
Shale	1"
Coal	32"
Shale	1"
Coal	14"
Altitude, 1310.	

Above the Hindman entry a prospect was made into a bed with the following section, the lower coal partly covered and approximate only:

Shale	5 ft.
Coal stain	13"
Cannel coal	15"
Splint coal	24"
Altitude, 1350.	

To the right of the gap, one-eighth mile, Mrs. Day has a sixteen-yard entry into a still higher bed, with the following section at its face:

Sandstone.	
Coal	18"
Shale	2"
Coal	14"
Shale	4"
Coal	20"
Altitude, 1385.	

These two coals above the Hindman bed are believed to have united with it on the head of Lewis fork, 2 miles east.

The bottom of the exposed flint bed in the ridge is at altitude 1,455 and of its top 1,475, and the top of the ridge is at 1,540.

On the right of Troublesome creek, $11\frac{3}{4}$ miles up it, the John Jones heirs have a ten-yard entry, with the following section at its face, except the bottom seam:

Flag Coal.

Shale.	
Coal	9"
Shale	1"
Coal	13"
Shale	6"
Coal	16"
Shale	15"
Coal	15"
Altitude, 1180.	

On the right, $12\frac{1}{8}$ miles up, is the following section:

Fire-clay Coal. (?)

Shale	7 ft.
Sandstone	$1\frac{1}{2}$ ft.
Shale	4 ft.
Black slate	3"
Coal (reported)	30"
Altitude, 850. (S.)	

LOWER BEAVER DAM BRANCH.

On the right, $12\frac{1}{2}$ miles up Troublesome creek. Altitude of mouth, 765.

On the left, one-eighth mile up this branch, is the following:

Whitesburg Coal.

Sandstone.	
Coal	5"
Shale	8"
Coal	(?)
Altitude, 790. (S.)	

At the head of a right drain, one-eighth mile up the branch, a prospect gives the following:

Flag Coal.

Shale	8 ft.
Coal	9"
Shale	1"
Coal	9"
Shale	5"
Coal	15"
Shale covered.	
Coal covered.	
Altitude, 1175. (S.)	

On the right, one-half mile up, is the following:

Fire-clay Coal. (?)

Sandstone.	
Shale	2 ft.
Coal	10"
Shale.	
Altitude, 855. (S.)	

On a right branch, three-fourths mile up, altitude of mouth, 905; on the left, one fourth mile up the next branch, is 3 feet of coal reported to have a two-inch parting 4 inches from the top. It is covered by 5 feet of shale, on which is sandstone. It is of the Hazard bed, at altitude 1,155. Assuming altitudes to be correct and a rise of strata up the branch, the bed here is slightly more than 20 feet below the Flag coal.

On the right, $12\frac{3}{4}$ miles up Troublesome creek, is the following:

Flag Coal.

Shale and sandstone..	5 ft.
Coal	17"
Shale	5"
Coal	14"
Shale	13"
Coal over	12"
Altitude, 1190. (S.)	

On a left branch, $12\frac{3}{4}$ miles up the creek and with mouth at altitude 765, on the left, one-half mile up the branch, Andrew Noble has a ten-yard entry, with the following bed section at its face:

Flag Coal.

Shale	10 ft.
Coal	13"
Shale	2"
Coal	3"
Shale	3"
Coal	5"
Shale	5"
Block coal	15"
Shale	10"
Coal	13"
Altitude, 1165. (S.)	

On the right, $13\frac{1}{4}$ miles up Troublesome creek, is a wet entry of the following section:

Flag Coal.

Shale.	
Coal	9"
Shale ..	1"
Coal	12"
Shale	6"
Coal	16"
Shale	14"
Coal (reported)	18"
Altitude, 1195. (S.)	

A five-inch coal under 10 feet of sandstone, 3 feet of shale (?) intervening in the first case, is exposed on the right, $13\frac{1}{8}$ miles up the creek, at altitude 790, and again at $13\frac{5}{8}$ miles up at altitude 780, indicating a southeasterly dip here, contrary to that assumed on Lower Beaver Dam branch.

BUCKHORN CREEK.

On the left, $13\frac{3}{4}$ miles up Troublesome creek. Altitude of mouth, 770.

On the left, one-eighth mile up this creek, Alfred Allen has an entry, now closed, reported by A. R. Crandall, in a private report, without naming the bed, as of the following section:

Flag Coal.

Coal	20"
Slate	3"
Coal	15"
Slate	6"
Coal	17"

The height of the entry is not given, but the bed section and coal below suffice to correlate the beds. Prof. Crandall also reported 26 inches of coal seen (said to be 40 inches thick) in a bed 40 feet below this entry. This is of the Hazard coal bed.

On a left branch, one-fourth mile up the creek, on the left, at the head of the branch, Taulbert Allen has a six-yard entry, with the following bed section at its face:

Flag Coal.

Shale	5 ft.
Coal	7"
Shale	1"
Coal	9"
Bituminous, shale	3"
Coal	20"
Bituminous shale	13"
Coal	17"
Altitude, 1140.	

The Hazard bed shows in a closed entry under the preceding with coal reported 38 inches thick and at altitude 1,110.

LAUREL BRANCH.

On the right, five-eighths mile up Buckhorn creek. Altitude of mouth, 775.

On the right, one mile up this branch, is the following:

Fire-clay Coal.

Sandstone.	
Shale	1½ ft.
Calcareous sandstone	5"
Shale	7"
Coal	2"
Shale	2"
Coal (with 2 clay part-	
ings)	9"
Altitude, 875. (S.)	

On the left, 1½ miles up, this same bed, apparently, has 9 inches of limestone over the 2 inches of coal, with shale above that, while under the two-inch coal is a foot of shale to a sandstone floor. Its altitude is 890.

On the right, 2¾ miles up, is the following:

Hamlin Coal.

Sandstone.	
Coal	8"
Bone coal	2"
Coal	4"
Black slate	3"
Coal	16"
Altitude, 1005. (S.)	

On the left of Buckhorn creek, 1¼ miles up it, is the following outcrop:

Fire-clay Coal (or Rider).

Shale	5 ft.
Coal	15"
Shale	8 ft.
Coal	12"
Shale	5 ft.
Altitude, 830.	

BEAR BRANCH.

On the left, $1\frac{3}{4}$ miles up Buckhorn creek. Altitude of mouth, 795.

MILLER BRANCH—On the left, $1\frac{3}{4}$ miles up Bear branch. Altitude of mouth, 990.

On a left branch, by Andrew Miller's house, one-half mile up Miller branch, Mr. Miller has an eight-yard entry with the following section at its face:

Flag Coal.

Shaly sandstone.	
Coal	21"
Shale	5"
Coal	17"
Shale	18"
Coal	17"
Shale	1"
Coal	3"
Shale	3"
Coal	1"
Altitude, 1160.	

On the right, opposite the preceding entry, Mr. Miller has a forty-yard entry, under 3 feet of exceptionally smooth sandstone, giving, half way in, 49 inches of coal. At the mouth of the entry the following section was obtained:

Sandstone.	
Coal	50"
Shale	21"
Coal	5"
Shale (over)	8"
Coal reported.	
Altitude, 1330.	

There is a good bench under this entry at altitude 1,300 and a coal bed is reported 5 feet above it. These two beds are believed to have united on Lewis fork.

Thin coal on the right of Miller branch, by the Miller house, at altitude 1,065, is possibly of the Young bed.

At the head of Miller branch, three-fourths mile up it, Mr. Miller has a fifteen-yard entry into the top of

the Flag coal (with no evidence of more coal below), with the following bed section 12 yards in:

Flag Coal.

Shale	5 ft.
Coal	5"
Shale	1"
Coal	10"
Shale	4"
Coal	17"
Altitude, 1170.	

The lowest seam of coal is in one block, and nearly a splint coal.

MULLINS FORK—On the right, $1\frac{3}{4}$ miles up Bear branch. Altitude of mouth, 990.

On the right, one-eighth mile up the fork, a coal is reported $1\frac{1}{2}$ feet thick, probably of the Haddix bed, at altitude 1,010.

On the right branch at this place, on the left, one-eighth mile up the branch, a four-yard entry gives the following:

Flag Coal.

Sandstone	5 ft.
Coal	10"
Shale	3"
Coal	4"
Shale	6"
Coal	16"
Bituminous shale	13"
Coal	13"
Altitude, 1170.	

Two knife-edge partings are in the middle of the upper coal seam.

On the right, five-eighths mile up Mullins fork, a prospect gives the following:

Flag Coal.

Shale	5 ft.
Coal	13"
Shale	1"
Coal	8"
Shale	4"
Coal	22"
Shale	22"
Coal (over)	9"
Altitude, 1180.	

Though the gap to Lewis fork is only about 100 feet higher, the ridges on each side are high enough to give a large working area to this bed.

On the right of Buckhorn creek, $2\frac{1}{8}$ miles up it, S. M. Noble has an eight-yard entry, partly filled with water when visited, which was judged to have about the section following. Two gray bands on the coal may have come from two thin clay partings additional, but they are probably outcrop effects only.

Hazard Coal.

Shale	8 ft.
Coal	2 ft.
Shale	1 ft.
Coal	2 ft.
Shale	1 ft.
Coal	1 ft.
Altitude, 1130.	

The resemblance of this section to the Flag section heretofore given would suffice for present correlation with that bed, but the altitude is more indicative of the Hazard coal and on Buckhorn waters the Flag bed rarely has so thick an upper seam of coal.

LONG FORK.

On the right, $2\frac{1}{4}$ miles up Buckhorn creek. Altitude of mouth, 800.

On the right, one-fourth mile up Long fork, an outcrop shows coal 24 to 32 inches thick, under 15 feet of massive sandstone at altitude 840. It is of the Whitesburg bed.

On the left, $2\frac{1}{8}$ miles up, is 8 inches of coal, under 15 feet of shaly sandstone, at altitude 875. This is of the Fire-clay coal.

RUSH BRANCH—On the right, $2\frac{1}{4}$ miles up Long fork. Altitude of mouth, 880.

On the head of a right branch, one-fourth mile up Rush branch, on the Taulbee and Allen tract, an opening gave the following:

Hazard Coal.

Shale	2 ft.
Coal	23"
Shale	6"
Coal	16"
Shale	12"
Coal	16"
Altitude, 1200.	

On the right near the head of Rush branch, three-fourths mile up it, is 31 inches of coal at altitude 1,280. This appears to be the Flag bed, a portion of it alone showing.

WILLIAMS FORK—On the right, $2\frac{1}{2}$ miles up Long fork. Altitude of mouth, 890.

On a right branch, one-fourth mile up this fork, a short entry into the Hamlin bed (with sandstone roof) gave 32 to 35 inches of fine looking coal, mostly splint. Its altitude is 950.

On the left, one-fourth mile up this fork, still on the Taulbee and Allen tract, the Haddix bed, with sandstone roof, has 33 inches of coal and is at altitude 1,090.

On the right of a right branch at its mouth, $1\frac{1}{2}$ miles up the fork, the Hazard bed has been opened at Mrs. Fugate's entry (now closed), where it showed about 3 feet of coal, with perhaps 2 feet more under water. Its altitude is 1,160. With Chestnut gap (to Lick branch) 125 feet higher and peaks rising some 200 feet more, a large area of this coal is available in this vicinity.

On the right of Long fork, $2\frac{3}{4}$ miles up it, is the following exposure:

Fire-clay Coal Rider.

Black shale	3 ft.
Coal	1"
Shale	2"
Coal	8"
Altitude, 900.	

CHESTNUT GAP BRANCH—On the right, $4\frac{1}{2}$ miles up Long fork. Altitude of mouth, 985.

On the right, at the branch, one-half mile up it, is 10 inches of coal under 5 feet of shaly sandstone at altitude, 1,050. This is probably of the Haddix bed, or part of it.

On a right branch, a mile up, on the right at its mouth, a wet entry shows the Hazard coal bed 5 feet or more thick, under 8 feet of shale, at altitude 1,165. A "tower" cliff rises from about 40 feet above the entry.

In Long fork, $4\frac{3}{4}$ miles up it, is 11 inches of coal, the lower half splint, under 5 feet of massive sandstone and on $1\frac{1}{2}$ feet of clay and shale. This, at altitude 1,010, is of the Haddix bed.

On the left, $4\frac{7}{8}$ miles up, is a long exposure of coal, 23 to 34 inches thick, under 10 feet of massive sandstone. This appears to be of the Haddix bed, with altitude 1,030.

On a left branch, $5\frac{1}{8}$ miles up, on the left at its mouth, a twelve-yard entry into the same bed gives 33 inches of coal, at the mouth of a twelve-yard entry, under a smooth, strong sandstone, at altitude 1,030.

The correlation of the Haddix bed on Long fork is determined by the somewhat similar sections on Williams branch of Troublesome creek and on lower Balls fork, notwithstanding the fact that it is here only 55 feet below the Hazard coal, or about where the Young bed should be expected.

On the right of the branch, one-eighth mile up, are the Smith prospects with the following sections:

Hazard Coal.

Shale.	
Coal	16"
Shale	3 ft.
Coal	43"
Clay	2"
Coal	19"
Shale	4"
Coal	22"
Altitude, 1085.	

Flag Coal.

Coal	16"
Slate	$\frac{1}{2}$ "
Coal	11"
Slate	4"
Coal	19"
Slate	11"
Coal	22"
Altitude, 1130.	

The Flag coal is given according to a reliable report, though the slate partings should probably more properly be called shale. The resemblance of the two sections is remarkable. Prof. Crandall gives similar sections to both openings, except that in the Flag bed the upper parting and lower seam of coal are lacking. Though not under cover, and consequently not fairly representative of the coal, analysis of his sample of the Flag coal, is given following:

Flag Coal.

Water	4.08
Volatile combustible matter	38.08
Fixed carbon	50.99
Ash	6.85
100.00	

The Haddix coal goes below drainage $5\frac{1}{4}$ miles up Long fork at altitude 1,030.

On the left, $2\frac{1}{2}$ miles up Buckhorn creek, an exposure by the road shows 18 inches of coal under 6 inches of cannel slate and then 15 feet of sandstone. This is probably of the Fire-clay coal (or rider), its altitude being 830.

LEWIS FORK.

On the left, $3\frac{1}{2}$ miles up Buckhorn creek. Altitude of mouth, 810.

At the head of a right drain, $1\frac{3}{4}$ miles up the creek, the Kentucky River Hardwood Co. has a prospect, partly closed, showing the following, the coal all much disintegrated:

Hindman Coal.

Earth.

Coal $3\frac{1}{2}$ to 4 ft.

Shale 21"

Coal 3"

Shale 11"

Coal $4\frac{1}{2}$ to 5 ft.

or more.

Altitude, 1340.

The bottom seam of coal is reported 7 feet thick.

On the right of the gap (altitude 1,323), at the head of the fork, 2 miles up it, a prospect shows 2 to 3 feet of coal at altitude 1,415. This coal is under smooth sandstone, with rough cliff sandstone above it in place of the flint found farther west.

From the developments so far made it appears that the three beds above the gap at the head of Fugate fork are reduced to two on the head of Bear branch, the coal at altitude 1,160 and the reported coal below it, and these two reduced to one—the Hindman—at altitude 1,340, on the head of Lewis branch, the intermediate sandstones and cannel coal having disappeared.

CLEMENTS FORK.

On the left, $4\frac{1}{2}$ miles up Buckhorn creek. Altitude of mouth, 820.

On the right, $1\frac{1}{4}$ miles up, at water level, is 1 foot

of coal under 15 feet of shaly sandstone at altitude 900. This is probably of the Fire-clay coal. Under it is about 20 feet of sandstone.

On the left, $3\frac{1}{2}$ miles up, 10 feet above the fork, is 8 inches of coal under 10 feet of sandstone at altitude 1,065. This seems to be of the Hamlin bed.

On a left branch, $3\frac{7}{8}$ miles up, on the right, one-eighth mile up the branch, a prospect shows well the following:

Flag Coal.

Shale	6 ft.
Coal	7"
Shale	2"
Coal	5"
Shale	6"
Splint coal	20"
Black slate	8"
Cannel coal	11"
Coal	6"
Altitude, 1185.	

On a left branch, 4 miles up, on the left of the branch, at its mouth and 10 feet above it, is a prospect showing poorly the following:

Flag Coal.

Sandy shale	3 ft.
Clay	1 ft.
Coal (with shale)	19"
Shale	5"
Coal	22"
Black slate	7"
Cannel coal	11"
Coal	5"
Altitude, 1185.	

The cannel coal in the two preceding sections has no definite line of separation from the black slate above it, but otherwise appears good. In the first of them it is inclined toward splint coal. In the following section across the ridge and down Horse Mill branch of South Quicksand creek, one mile, common coal replaces the cannel.

Flag Coal.

Shale.	
Coal	10"
Shale	1"
Coal	7"
Shale	5"
Coal	16"
Shale	8"
Coal	18"
Altitude not taken.	

The uniformity of this bed and its large area here, at the base of the hill on both sides (being at track level and beside it at the last named point) gives certainty of a large amount of coal to be mined when it shall become profitable to work it with such partings.

On the left, $7\frac{1}{4}$ miles up Buckhorn creek, is 5 feet of black slate, a bed which seems to show at a number of points along and close to the creek for several miles above, but openings farther up the creek indicate nearly level strata, and the exposures are therefore considered of successive strata.

On the left, $7\frac{1}{2}$ miles up, is 6 inches of coal under 3 feet of shaly sandstone and over 3 feet of shale, 3 feet above the creek, at altitude 885. This may represent the Fire-clay coal rider.

DANS FORK.

On the right, 8 miles up Buckhorn creek. Altitude of mouth, 890.

At the head of a left drain, one-eighth mile up this fork, on the James Hays tract (now Pardee) is an entry, now closed, into what is assumed to be of the Hazard bed, but may be of the Flag, the two being opened, nearly alike, on the head of Long fork, 2 miles south.

Hazard Coal.

Shale	5 ft.
Coal	14"
Shale	2"
Coal	3"
Black slate	2"
Coal	6"
Shale	2"
Coal	18"
Shale	10"
Coal	17"
Altitude, 1140.	

My former sample from this entry, then 8 yards in, included all the coal, the two lower seams of which appeared particularly fine. The sample, analyzed by S. D. Averitt, gave the following results:

Laboratory No. 2735.

Moisture	1.76
Volatile combustible matter	41.98
Fixed carbon	49.67
Ash	6.59
	100.00
Sulphur	1.83
Phosphorus	0.013
Specific gravity	1.294
Coke (dense spongy)	56.26
Total carbon	72.97
B. T. U. per pound of coal.....	13,862

"Average sample like No. 2732 (soft and light), but considerably weathered, and with a good deal of ferruginous incrustation." No. 2732 is from the Hazard bed at the head of Lost creek.

HURRICANE BRANCH.

On the right, 10 miles up Buckhorn creek. Altitude of mouth, 940.

Five feet of black slate is here at water level and it is overlain by 20 feet of shale.

Coal reported 3 feet thick has been taken from the branch 1 mile up it, at altitude 1,050. Strata rise quite

rapidly up stream, so that this coal appears to be below drainage farther down the fork, but it is more likely to be cut out by the sandstone which shows most of the way from the mouth of the fork to this point, from stream level to a height of 20 to 40 feet.

On the left, 5 feet above the branch, $1\frac{1}{4}$ miles up it, is $1\frac{1}{2}$ feet of coal under 10 feet of sandstone, at altitude 1,075.

On the left, at branch level, $1\frac{1}{2}$ miles up it, is 37 inches of coal under 2 feet of sandstone, at altitude 1,090. The coal goes below drainage here.

The similarity of these three openings to the coal at altitude 1,030 on the head of Long fork is striking and they must be regarded of the same (Haddix) bed. The Hazard and Flag beds should be found about 50 and 100 feet higher.

On the right of a left drain, $1\frac{1}{4}$ miles up Buckhorn creek, 320 feet above it, is a closed entry showing in a bed (including 2 feet of coal not mined) a thickness of some 6 feet. There are said to be two partings in it; one of these, left as roof—3 inches thick and with 2 feet of coal showing below it. Five feet of shale lie on the coal. The thickness of the bed and its altitude—1,280—are indicative of the Hindman bed. The height of the hill upon it is sufficient to provide a large working area.

A bench at altitude 1,160, then gives the approximate position of the Flag coal, another at 1,120 of the Hazard coal and a third at 1,040 that of the Haddix coal. The latter bench is in part utilized as a burying ground beside the road near the mouth of the drain.

BOUGH CAMP BRANCH.

On the right, $1\frac{1}{2}$ miles up Buckhorn creek. Altitude of mouth, 970.

At the mouth of this branch, at its level, is 6 inches of coal under 20 feet of sandstone, possibly of the Hamlin bed.

On the right, a mile up this branch, William Combs has a one-yard entry with the following section at its face:

Flag Coal.

Shale	10 ft.
Coal	8"
Shale	1"
Coal	9"
Shale	2"
Coal	7"
Shale	8"
Splint coal	18"
Shale	11"
Block coal	16"
Altitude, 1265.	

FALLEN ROCK BRANCH—On the left, $1\frac{1}{8}$ miles up Bough Camp branch. Altitude of mouth, 1,100.

Coal shows in the branch, one-fourth mile up it, at altitude 1,125.

At the mouth of a right branch, one-half mile up, altitude 1,160, a coal stain shows 15 feet higher. These coals appear to be of the Haddix and Hazard beds.

On the left of this right branch, at its mouth, Andrew Combs has a closed entry into the Flag coal at altitude 1,300.

On the left, $1\frac{1}{4}$ miles up Bough Camp branch, 5 feet above it, old entries, under 4 feet of shale and then 5 feet of sandstone, indicate a thickness of coal of some 3 feet. These, at altitude 1,130, are of the Haddix bed.

On the right, at the mouth of a right hollow, 12 miles up Buckhorn creek, Thomas Hays has an eight-yard entry with the following bed section at its face:

Flag Coal.

Shale	5 ft.
Coal	12"
Shale	1"
Bony coal	3"
Shale	1"
Coal	4"
Shale	4"
Coal	19"
Shale	11"
Coal	17"
Altitude, 1250.	

UPPER BEAVER DAM BRANCH.

On the right, 15 miles up Troublesome creek. Altitude of mouth, 780.

On the right, one-half mile up this branch (on its right fork), Mowbray & Robinson have a fifteen-yard entry with the following section, the lower 4 feet measured at the face, the rest not mined:

Flag Coal.

Shale	5 ft.
Coal	10"
Shale	2"
Coal	3"
Shale	2"
Coal	12"
Shale	5"
Coal	18"
Shale	11"
Coal	18"
Altitude, 1160. (S.)	

CAT HOLLOW.

On the right, $15\frac{3}{4}$ miles up Troublesome creek. Altitude of mouth, 790.

On the right, one-fourth mile up the branch, is 28 inches of coal, under $21\frac{1}{2}$ feet of shale and then 10 feet of sandstone, at altitude 1,045. This is of the Haddix bed.

On the right, three-eighths mile up, Floyd Campbell has a four-yard entry with the following bed section at its face:

Flag Coal.

Shale	10 ft.
Coal	4"
Clay (thin)	
Coal	7"
Clay (thin)	
Coal	2"
Shale	2"
Coal	10"
Shale	3"
Coal	15"
Shale	10"
Coal (over)	12"
Altitude, 1205.	

The top of the tower sandstone and hill on the left are at altitude 1,365.

On the right, 16½ miles up Troublesome creek, is the following exposure, the three coal seams being considered of the Whitesburg bed, the upper, probably the top seam of the bed, being at altitude 835.

Whitesburg Coal.

Sandstone	10 ft.
Coal	15"
Shale	4 ft.
Sandstone	25 ft.
Coal	5"
Shale	1½ ft.
Coal	5"
Fire-clay.	
Altitude, 805.	

On a left branch 16¾ miles up the creek, on the left, one-fourth mile up the branch, Green Campbell has a fifteen-yard entry with the following section at its mouth:

Flag Coal.

Sandstone	3 ft.
Shaly sandstone	2 ft.
Coal	13"
Shale	2"
Coal	4"
Shale	2"
Coal	3"
Shale	6"
Splint coal	15"
Shale	11"
Block coal	17"
Altitude, 1205.	

FRANCIS BRANCH.

On the left, 17 miles up Troublesome creek. Altitude of mouth, 795.

On the right of a right hollow, one-eighth mile up the branch and hollow both, a prospect shows the following:

Fire-clay Coal (Rider).

Shale	5 ft.
Black slate	2 ft.
Coal	5"
Clay	1"
Coal	2"
Altitude, 890. (S.)	

On the point of a spur on the left, one-fourth to one-half mile up, the following notes were obtained:

Summit	1360
Cliff	1285
Cliff	1260
Bench	1245
Hard sandstone cliff	1210
Flag coal entry	1180
Bench	1160
Iron ore	1065
Shale	1055
Coal stain under 10 ft. sandstone.....	885
Fire-clay coal stain	870
Sandstone	850

On the left of the branch, one-half mile up it, Hays and Campbell have a twelve-yard entry with the following section at the face, but with 7 feet of shale showing over the coal at its mouth:

Flag Coal.

Sandstone.	
Coal	15"
Shale	1"
Coal	13"
Shale	2"
Splint coal	12"
Shale	11"
Splint coal	11"
Soft coal	1"
Altitude, 1180	

In the branch, three-fourths mile up, is 4 inches of coal, under 4 feet of shale, at altitude 925, supposed to be of the Fire-clay coal rider.

NOBLE BRANCH.

On the right, 17½ miles up the creek. Altitude of mouth, 800.

In a left drain at the mouth of the branch Anderson Hays has an unfinished prospect into the Haddix coal, 27 inches thick, under 2 feet of shale and then 2 feet of thin-bedded sandstone, at altitude 1,070.

The branch forks one-fourth mile up it.

A quarter mile up the right fork there is 2 feet of limestone at altitude 1,010.

On the left, one-half mile up, at the face of a forty-yard entry, the Haddix coal has 33 inches of coal under 2 feet of shale and then 12 feet of shaly sandstone, at altitude 1,035.

On the right, one-half mile up the left fork, 20 feet above it, Mary Allen has an eight-yard entry with the following section at its mouth:

Haddix Coal.

Shale	4 ft.
Clay sandstone	2 ft.
Shale	8 ft.
Coal	9"
Cannel coal	24"
Black slate, .	
Altitude, 1025.	

On Noble branch Charles Hendrie obtained an outcrop sample of 23 inches of cannel coal, which was overlain by 12 inches of common coal, probably at the opening of the foregoing entry. This, analyzed by Dr. R. Peter, gave the following results:

Haddix Cannel.

Chemical Report No. 3111.

Moisture	0.70
Volatile combustible matter	50.90
Fixed carbon	36.70
Ash (gray)	11.70
	100.00
Sulphur	3.845
Coke (dense)	48.40

STEVE BRANCH.

On the left, $17\frac{3}{4}$ miles up the creek. Altitude of mouth, 805.

On this branch the following section was taken from its mouth to the cliffs above the entry on the right, three-eighths mile up:

Sandstone	1290
Sandstone	1265
Thick Flag coal stain	1170
Haddix coal, 31 inches	1070
Broad bench	1055
Limestone	970
Bench (Fire-clay coal, Rider)	915

The 31 inches Haddix coal was found in an abandoned entry of Samuel Napier's. It is especially bright, fine-looking coal, overlain by 15 feet of sandy shale and thin-bedded sandstone. The interval down from the fifty-foot sandstone serves to correlate the Flag bed.

ROWDY BRANCH.

On the right, $17\frac{3}{4}$ miles up the creek. Altitude of mouth, 805.

On the left at the head of a right hollow, one-fourth mile up the branch, Andrew and Samuel Noble have a twelve-yard entry with the following section, the lower seam of coal (not mined), measured at the mouth and the upper seams at the face:

Hazard Coal.

Coal	35"
Clay shale	2 to 4"
Coal	17"
Shale	3"
Hard block coal	6"
Coal	3"
Altitude, 1130.	

Following is a section as obtained in this hollow:

Hill top	1365
Sandstone (Lower cliff)	1270
Narrow bench	1250
Bench (Flag coal)	1180
Hazard coal entry	1130
Haddix coal stain	1095
Bench (Hamlin coal)	985
Bench (Fire-clay coal)	890

The Flag coal, as on Francis and Steve branches, is about 100 feet below the thick "tower" sandstone, and the Hazard coal only 45 feet above the Haddix. The interval from the Flag to the Haddix bed, 160 feet on Cat Hollow, is reduced to about 100 feet here.

The Francis coal is on the bench at 1,250, and the place of the Hindman bed is on top of the unusually thick tower rock.

On a right drain, five-eighths mile up the branch, on the right, one-eighth mile up the drain, the Campbell heirs have a seven-yard entry with the following section:

Fire-clay Coal or Rider.

Shale.

Coal 10"

Shale 2"

Coal 6"

Shale 1"

Coal 4"

Clay (thin).

Coal 6"

Shale 0 to 3"

Coal 12"

Altitude, 925. (S.)

The branch forks, $1\frac{5}{8}$ miles up, at altitude 980.

On the right, one-eighth mile up the left fork, is a five-yard entry with the following bed section at its face:

Hamlin Coal.

Sandstone 15 ft.

Coal 7"

Clay 1"

Coal over 21"

Altitude, 1020.

On the left of a right drain, 18 miles up Troublesome creek, one-fourth mile up the drain, Lee Allen has a ten-yard entry with the following section at its mouth, the lower seam of coal alone mined:

Hazard Coal.

Shaly sandstone	5 ft.
Shale	3 ft.
Coal	5"
Shale	2"
Coal	12"
Shale (with coal)	2 ft.
Coal	36"
Altitude, 1170.	

With altitude to answer for either the Flag or Hazard bed, the thick coal at the base of the section determines it to be of the latter.

On the left of a left branch, $18\frac{3}{4}$ miles up the creek, on the left, one-eighth mile up the branch, an uprooted tree gives a stain of the Haddix coal, with altitude of 1,055. Cliff sandstones along the creek prevail from altitude 850 to this coal.

On the left of the creek, at the road 100 yards beyond its crossing of the preceding branch, an incomplete exposure gives the following section:

Fire-clay Coal.

Red and brown clay..	1 ft.
Flint fire-clay	4"
Coal	1 ft.
Red and brown clay and shale	1½ ft.
Sandstone.	
Altitude, 860.	

The color of the clay may be the result of burning of the coal in outcrop. The coal and clay appear to be completely cut out by sandstone at the branch below the exposure.

Excepting about the mouth of Cockerel fork, 3 miles west of this point, no other appearance of the flint fire clay is known to have been found on Troublesome creek waters below Big branch, $3\frac{1}{4}$ miles below Hindman.

On a right drain, $19\frac{1}{2}$ miles up the creek, at the head of the drain, one-eighth mile up, S. M. Holliday has a ten-yard wet entry with the following bed section at its mouth:

Haddix Coal.

Sandstone	5 ft.
Coal	8"
Shale	7"
Coal	1"
Shale	7"
Coal	33"
Clay	1"
Coal	11"

Altitude, 1045.

McNELLY (McKINLEY) BRANCH.

On the left, $19\frac{3}{4}$ miles up the creek. Altitude of mouth, 815.

On the left, one-fourth mile up this branch, an entry gives the following section:

Fire-clay Coal (Rider).

Shale.	
Black slate.	
Coal	6"
Clay.	
Covered	4 ft.
Coal	18"

Altitude, 890. (S.)

On the left, one-half mile up, is the following exposure:

Fire-clay Coal (Rider).

Thin-bedded and shaly sandstone	40 ft.
Shale	3 ft.
Sandstone	10"
Shale	2"
Coal	2"
Shale	1"
Coal	4"
Black shale	2"
Shale	3"
Sandy fire-clay	2 ft.
Shale	$3\frac{1}{2}$ ft.

Altitude, 895.

A gray limestone appears at seven-eighths mile up the branch; altitude 935, and dark fossil limestone at $1\frac{1}{4}$ miles up; altitude 1,025.

On the left, $1\frac{1}{2}$ miles up, a forty-yard entry has the following bed section 35 yards in:

Haddix Coal.

Sandstone	7 ft.
Shale	$1\frac{1}{2}$ ft.
Coal	24"
Shale	3"
Coal	8"
Altitude, 1055. (S.)	

TOMS BRANCH.

On the right, $20\frac{1}{2}$ miles up the creek. Altitude of mouth, 820.

RIGHT FORK.

On the right, seven-eighths mile up the branch. Altitude of mouth, 900.

On the left, one-eighth mile up this fork, a long entry gives the following section near its mouth.

Haddix Coal.

Sandstone.	
Coal	12"
Clay	1"
Coal	16"
Clay	1"
Coal	20"
Altitude, 1090.	

This coal goes under the fork, three-eighths mile up it, at altitude 1,085, showing that the fork is nearly on the line of strike.

On the left, one-half mile up, a now closed prospect formerly gave the following:

Hazard Coal.

Coal stain	9"
Earth	9"
Coal	6"
Clay	6"
Coal	71"
Altitude, 1190.	

In a recent visit to this opening it was found that the 18 inches of earth and coal stain had disappeared and in their place is shale or shaly sandstone. The height of the bed leaves open the question of whether this is the Hazard or Flag and no other coal has been found on the fork to answer it. The stain now gone is proof of a slightly higher bed, and this therefore must be the Hazard, with interval from the Haddix bed, 100 feet—somewhat greater than usual on Troublesome creek, and considerably more than on Rowdy creek.

LEFT FORK.

On the left, seven-eighths mile up Toms branch. Altitude of mouth, 900.

On a left branch, three-eighths mile up the fork, on the right, one-eighth mile up the branch, J. Smith has an entry with the following bed section:

Haddix Coal.

Sandstone	3 ft.
Coal	4"
Shale	1"
Coal	33"
Altitude, 1100. (S.)	

An early investigation gave the following on the left of Troublesome creek above Toms branch:

Flag Coal.

Cliff sandstone	70 ft.
Coal	6"
Shale	9"
Coal	12"
Altitude, 1205.	

It is probable that more coal of this bed lies close below that found.

Haddix Coal.	
Cliff sandstone	40 ft.
Coal	5"
Shale	2"
Coal	2"
Shale	20"
Coal	36"

Altitude, 1105.

Bastard limestone.

Altitude, 1030.

Whitesburg Coal (Upper seam).	
Sandstone	30 ft.
Thin coal.	
Covered	10 ft.
Thin coal.	
Altitude, 840.	

McJILTON BRANCH (LICK FORK).

On the right, 21½ miles up the creek. Altitude of mouth, 825.

On the left of a right branch, three-fourths mile up, at its head, one-half mile up the right branch, a two-yard entry has the following section:

Hazard Coal.

Shale.	
Coal	54"
Shale	12"
Coal	21" (?)
Altitude, 1270.	

The thick coal of the upper seam gives reason for the correlation advanced, the altitude given being probably too great.

On the left, one mile up McJilton branch is the following exposure:

Fire-clay Coal.

Shaly sandstone	2 ft.
Bituminous shale	1 ft.
Coal	1 to 2"
Brown and red shale	3 ft.
Coal	12"
Shale and pyrite	1"
Coal	4"
Sandstone to branch	10 ft.
Altitude of coal, 980.	

The colored shale here resembles that of the colored clay in the Fire-clay coal bed at the road 18¾ miles up the creek.

LEFT FORK.

On the left, $1\frac{1}{4}$ miles up the branch. Altitude of mouth, 1,030.

On the right at the head of the fork, one-fourth mile up, Richard Smith has an eighteen-yard entry with the following bed section half way in:

Hazard Coal.

Sandstone	5 ft.
Clay	8 ft.
Coal	81"
Altitude, 1255.	

This lies on a broad bench, which with its thickness is indicative of the Hazard coal. It lies 75 feet above the gap to the small branch flowing into Troublesome creek at the mouth of Pigeon Roost branch.

LAUREL BRANCH.

On the left, 22 miles up the creek. Altitude of mouth, 825.

A four-foot bed of limestone on the left, one-half mile up, under thick, shaly sandstone at altitude 970, is the only thing to report on this branch. Probably the Haddix coal lies about 40 feet above it.

On the right of the creek, $22\frac{1}{2}$ miles up, Jack Dobson has a twenty-yard entry with the following section 7 yards in:

Hazard Coal.

Shale.	
Coal	30"
Shale	5"
Coal	37"
Altitude, 1220. (S.)	

WILLIAMS BRANCH.

On the left, 23 miles up the creek. Altitude of mouth, 830.

On a left drain, one-fourth mile up, on the right, one-eighth mile up the drain, Walter Campbell has an entry with the following section:

Haddix Coal.

Shale.	
Coal	22"
Shale	8"
Coal	12"
Altitude, 1085. (S.)	

On a right branch, seven-eighths mile up, on the right, one-fourth mile up it, a five-yard entry gives the following bed section at its face:

Hazard Coal.

Sandstone	8 ft.
Coal	9"
Good bony coal	5"
Coal	5"
Friable coal	3"
Block coal	18"
Altitude, 1160. (S.)	

BUCK FORK.

On the left, $1\frac{1}{4}$ miles up Williams branch. Altitude of mouth, 960.

On a left branch, one-eighth mile up the fork, on the right, one-eighth mile up the branch, Mr. Ashley has a four-yard entry into the Hazard bed, with 33 inches of coal under 5 feet of sandstone forming an uneven roof. Its altitude is 1,180.

A foot of limestone under 10 feet of shale, probably about 40 feet below the Haddix coal, shows at three-eighths mile up the fork at altitude 1,020.

On a left branch, three-eighths mile up, on the left, one-eighth mile up the branch, an entry gives the following section:

Hazard Coal.

Sandstone	5 ft.
Shale	1"
Coal	15"
Bone coal	4"
Coal	20"
Altitude, 1180. (S.)	

At $1\frac{5}{8}$ miles up Williams branch is 2 feet of limestone at altitude 1,035.

On the right, $1\frac{3}{4}$ miles up the branch, Preston Williams has a five-yard entry with the following section at its face:

Haddix Coal.

Shale.	
Coal	16"
Slate	16"
Block coal	9"
Altitude, 1060. (S.)	

In this close vicinity a former opening into this bed near the level of the branch gave the following section:

Haddix Coal.

Sandstone	10 ft.
Shaly sandstone	15 ft.
Shale	3 ft.
Coal	18"
Cannel coal	4"
Shale	9"
Clay	8"
Coal	6"
Altitude, 1060. (?)	

BEECH BRANCH.

On the right, 23 miles up the creek. Altitude of mouth, 830.

On the left, at the branch, one-eighth mile up it, is 16 inches of coal on 3 feet of clay and under 4 feet of shaly sandstone at altitude 890. This is about 15 feet under the Fire-clay coal, a seam not often found, but not unknown.

In and by the branch 50 yards or more farther up it is the following exposure:

Fire-clay Coal.

Shaly sandstone	5 ft.
Shale	1½ ft.
Coal	8"
Shale	8 ft.
Coal	14"
Shale	1"
Coal	4"
Shaly sandstone.	
Altitude, 910.	

RIGHT FORK.

On the right, three-eighths mile up. Altitude of mouth, 990.

On the left, at a spring at the mouth of the fork, is coal reported, but 4 inches thick. This, at altitude 1,005, is of the Hamlin bed, and is likely to have more coal below that found.

On the right, one-eighth mile up the fork, George Stacy has a fifteen-yard entry with the following bed section 5 yards in, about 18 inches of top coal and 3 inches at the bottom not mined:

Hazard Coal.

Massive sandstone	10 ft.
Shaly sandstone	 2 ft.
Coal	 6"
Shale	 4"
Coal about	52"
Clay	 1"
Coal about	40"
Altitude, 1230. (S.)	

The plentiful stain of the Flag coal was found 65 feet above the entry at altitude 1,295.

On the left, at Jasper Stacy's, $23\frac{3}{8}$ miles up Troublesome creek, the following notes were taken:

20 ft. rough sandstone cliff at altitude.....	1,285
Closed entry Flag coal with thick shale covering, reported 8-ft. bed with thick parting near bottom and one smaller	1,235
Of two entries under 15 ft. of massive sandstone, one 20 yards in, has coal 36 inches at mouth and 33 inches at face. Hazard coal	1,190
Old prospect on bench. Apparently no coal.....	1,155
Haddix bench	1,090
Probable place of Fire-clay coal	890
Troublesome creek	830

That the eight-foot bed on Beech branch is the same as the three-foot bed here and not the eight-foot bed 40 feet higher seems hardly possible, and the correlation

adopted may prove erroneous. In that case the three-foot bed becomes the Young and the higher bed the Hazard. It is likely, however, that more coal lies beneath the present floor of the three-foot bed, for it is intermediate in position and height to the Hazard coal opened on Beech branch and that on Lick branch of Balls fork, the latter only a half mile away. These three openings, too, all have sandstone roof, while the eight-foot Stacy bed has shale which appears unlikely to revert immediately to sandstone underground.

BALLS FORK.

On the left, $23\frac{7}{8}$ miles up the creek. Altitude of mouth, 835.

LICK BRANCH.

On the left, three-fourths mile up Balls fork. Altitude of mouth, 840.

On the left, one-eighth mile up the branch, Lewis Holliday had an opening with the following section:

Haddix Coal.

Sandstone	15 ft.
Coal	4"
Cannel coal	5"
Coal	23"
Altitude, 1070.	

Over this he has now a prospect into the lower bench of coal following and a three-yard entry into the upper bench. Of the lower bench a foot of coal was visible and measurement of the upper was taken at the mouth of the entry.

Hazard Coal.

Massive sandstone.....	25 ft.
Coal	22"
Shale	4 ft.
Coal bed	2 ft. or more
Altitude, 1170.	

A ten-foot cliff lies close under the floor of the bed.

On each side of Lick branch, one-fourth mile up it, are the exposures following, which illustrate the rapid changes in this region of thickness of strata and of their appearance after weathering:

Fire-clay Coal.

(1)		(2)	
Soft sandstone	3 ft.	Laminated sandstone	10 ft.
Coal	9"	Shale	30 ft.
Covered	3 ft.	Coal	5"
Shale	5 ft.	Shale	10 ft.
		Coal	6"
		Shale	4 ft.

Both sections are based at the branch, at altitude 870.

All openings on this branch farther up it are reported fallen in, but from a former reconnaissance the following notes are obtained, location and heights of openings given somewhat indefinite and unreliable and correlations uncertain. The presence of a fine bed of coal is evident and it has a large area in the vicinity.

At McNapier's, $1\frac{1}{2}$ miles up the branch, the following section was found:

Hazard Coal.

Sandstone	5 ft.
Coal	20"
Shale	8"
Coal	42"
Shale	3"
Coal	1"
Clay	5"
Coal about	33"
Altitude, 1130.	

The bottom seam of coal was covered with mud and water, so that it could not be measured accurately, and it may contain a parting. The sandstone under the Haddix coal forms a prominent cliff along here, as recently noted, about 20 feet high and with its base at altitude about 1,050, some 50 feet above the branch.

At 3 miles up the branch the Ingalls coal gave the following section:

Hazard Coal.

Shaly sandstone.	
Coal	12"
Shale	24"
Coal	43"
Clay	1"
Coal	20"
Shale	19"
Altitude, 1175.	

On the left, 1 mile up Balls fork, a thin coal under massive sandstone gives probably the upper seam of the Whitesburg bed at altitude 860.

GEORGES BRANCH.

On the right, $1\frac{1}{4}$ miles up Balls fork. Altitude of mouth, 850.

On the left, $\frac{1}{8}$ mile up a right drain at the mouth of this branch, the Fugate brothers have a closed entry into 2 to $2\frac{1}{2}$ feet of coal, in part cannel. Two feet of shaly and then massive sandstone cover the bed, while 8 feet under it is a ten-foot sandstone cliff. It is of the Haddix bed, at altitude 1,100.

On the right, $\frac{1}{4}$ mile up the branch, the Fugate brothers have a six-yard entry with the following bed section at its face:

Flag Coal.

Shale	8 ft.
Coal	11"
Hard shale	1"
Coal	11"
Shale	3"
Block coal	13"
Hard dark clay	11"
Block coal	13"
Altitude, 1250.	

A distinct bench, below the entry, at altitude 1,170, is probably 20 to 30 feet below the Hazard coal.

On the right, $1\frac{3}{8}$ miles up Balls fork, a prospect gives the following:

Hamlin Coal.

Shale	2 ft.
Coal	14"
Shale	5 ft.
Coal	9"
Altitude, 1000.	

On the left, $2\frac{1}{8}$ miles up, in a rock house 15 feet high, and again on the right at the fork, $2\frac{1}{4}$ miles up, under 10 feet of shaly sandstone and above 10 inches of shale, a seam of the Whitesburg bed has 17 inches of coal, at altitude 870.

On the right of a right branch, $2\frac{3}{4}$ miles up Balls fork, $\frac{1}{4}$ mile up the branch, Addison Fugate has a partly closed prospect giving the following section:

Hazard and Flag Coals.

Massive sandstone	4 ft.
Coal or shale	2"
Coal	4"
Clay	1"
Coal	12"
Splint coal	18"
Coal	2"
Shale	8"
Coal	14"
Shale	10"
Coal	3 to 5 ft.
Altitude, 1200.	

On Coles branch, across the ridge at the head of this branch, there is evidence of the close approach of these beds. The remarkable thickness of coal at this opening and correspondence of section with those on Coles branch (see page 102) leave little room for doubt of the junction of the two beds.

The place of the Haddix bed is plainly shown between this opening and the Whitesburg bed at the fork at altitude 1,110, between two prominent cliffs 10 feet apart.

At the mill dam, 3 miles up Balls fork, the Whitesburg upper seam goes below drainage, still 17 inches thick, at altitude 875.

On a left branch, $3\frac{1}{8}$ miles up the fork, Samuel Fugate has an eight-yard entry with the following section at its face:

Hazard Coal.

Sandstone.	
Coal	10"
Shale	1"
Coal	24"
Shale	7"
Coal	16"
Altitude, 1215.	

A drop of the sandstone at the mouth of the entry cut out there the upper seam of coal and parting. It is possible that the floor of the entry is a parting and that the main coal is beneath it. A bench at altitude 1,150 marks the place of the Young coal.

ROARING BRANCH.

On the right, $3\frac{7}{8}$ miles up Balls fork. Altitude of mouth, 900.

ELISHA FORK—On the left, $\frac{1}{4}$ mile up the branch. Altitude of mouth, 985.

In a right drain at the mouth of a left branch, $\frac{1}{2}$ mile up Elisha fork, a prospect gives the following section:

Hazard Coal.

Sandstone	2 ft.
Coal	3"
Clay	20"
Coal	30"
Altitude, 1245.	

In this left branch, $\frac{1}{4}$ mile up it, is a three-yard entry, under 2 feet of sandstone, having 40 inches or more of coal, the lower foot hidden in water. This is of the Hazard bed, at altitude 1,245.

On the left of the fork, $1\frac{1}{8}$ miles up it, a covered prospect gives the altitude of the Hazard coal at 1,250.

Above and just beyond this an eight-yard wet entry shows the Flag bed over 4 feet thick, under sandstone, at altitude 1,330.

On the right, 1 mile up Roaring branch, a coal stain in the road, beside a spring, under 5 feet of shale, at altitude 1,140, seems to have no place in the series and is probably not extensive in area.

On the right above this outcrop Henry Combs has a wet entry, under sandstone, having 50 inches of coal, the lower foot in water and not seen. This is of the Hazard bed at altitude 1,285.

On the right of Balls fork, 4 miles up it, the Fire-clay coal, probably, has 23 inches of coal, under 8 feet of shale and then sandstone, at altitude 940.

BIG BRANCH.

On the right, $4\frac{3}{4}$ miles up Balls fork. Altitude of mouth, 915.

On the right, $\frac{1}{8}$ mile up this branch, a seam of the Whitesburg coal, rising from below drainage and 15 inches thick, is exposed under 6 inches of black slate and then 10 feet of shale at altitude 925.

BEECH CREEK—On the right, $\frac{3}{8}$ mile up Big branch. Altitude of mouth, 935.

The preceding coal goes below drainage about at the mouth of this creek.

On the right, $\frac{3}{8}$ mile up, Jason Richie has a fifteen-yard wet entry, showing at its mouth, under earth cover, a coal bed about $6\frac{1}{2}$ feet thick, a considerable proportion of it understood to be shale. This is of the Haddix bed at altitude 1,180.

On the left, $\frac{1}{2}$ mile up the creek, opposite a right branch, with mouth at altitude 995, and, again, on the right 100 yards farther up the creek, are the following exposures:

Fire-clay Coal.

Shale.		Shale.	
Sandstone	1½ ft.	Black slate	2 ft.
Shaly sandstone	5 ft.	Shaly sandstone	10 ft.
Coal	2"	Black slate	10 ft.
Shale	6 to 9"	Shale	8"
Coal	6"	Coal	½"
Clay.		Shale	4"
Sandstone	1 ft.	Coal	10"
Altitude, 995.		Altitude, 1010.	

In a left drain opposite the higher of these sections the Haddix coal is opened with 1 foot of shale roof and then 2 feet of sandstone on 33 inches of coal at altitude 1,200. Probably more coal could be found under a thick parting below, but the top of the Haddix cliff is but about 5 feet lower.

The Fire-clay coal, in a roll where just described, goes under the creek $\frac{5}{8}$ mile up it.

On a right branch, $1\frac{1}{8}$ miles up the creek, $\frac{3}{8}$ mile up the branch to its right branch and in the latter, $\frac{1}{8}$ mile up, is 15 inches of coal under a foot of iron ore and then shale. This coal, probably of the Hamlin bed, is at altitude 1,140.

On the same right branch, $\frac{1}{2}$ mile up it, a pit has been sunk into the same coal with like thickness and altitude.

On the left, $\frac{5}{8}$ mile up Big branch, 5 feet above it, is 5 inches of coal, probably a part of the Whitesburg bed, under 10 feet and above 5 feet of shale. Its altitude is 975.

On the right, $1\frac{1}{4}$ miles up the branch, is the following coal, 5 feet above the branch:

Fire-clay Coal.

Sandy shale	8 ft.
Coal	9"
Shale	22"
Coal	13"
Shale	5 ft.
Altitude of coal, 1015.	

On the right, $1\frac{1}{2}$ miles up, this coal, at branch level, has like thickness, but with parting increased to $2\frac{1}{2}$ feet. Over it here is 30 feet of shale and then 10 feet of sandstone.

SAND LICK BRANCH—On the right, $1\frac{1}{2}$ miles up Big branch. Altitude of mouth, 1,030.

On the left of a right branch, with mouth at altitude 1,100, $\frac{5}{8}$ mile up Sand Lick branch, $\frac{1}{4}$ mile up the right branch, Rachel Patrick has a four-yard wet entry with the following section at its mouth; the lower foot of it not seen:

Haddix Coal.

Sandstone	5 ft.
Coal	18"
Shale	24"
Coal	38"
Altitude, 1250.	

On a left branch of Big branch, with mouth at altitude, 1,080, on the left, $\frac{3}{8}$ mile up the left branch, is a two-yard entry with the following section, and possibly more coal under its floor:

Haddix Coal.

Sandstone	4 ft.
Coal	10"
Clay	6"
Coal	30"
Altitude, 1205.	

ROAD BRANCH—On the right, $2\frac{5}{8}$ miles up Big branch. Altitude of mouth, 1,110.

On the left, $\frac{1}{4}$ mile up this branch, a foot of the Fire-clay coal is in outcrop at altitude 1,130.

On the left of a right branch, $\frac{5}{8}$ mile up Road branch, $\frac{1}{4}$ mile up the right branch, James Patrick has a two-yard entry with the following bed section at its face:

Flag Coal.

Sandstone	2 ft.
Shale	2 ft.
Coal	1½"
Shale	½"
Coal	16"
Shale	5"
Hard block coal	18"
Shale	12"
Hard block coal	20"
Altitude, 1430.	

On the left, $\frac{3}{4}$ mile up Road branch, the Collins heirs have a prospect into the Haddix bed giving 36 inches of coal under 5 feet of shale and then 4 feet of sandstone, at altitude 1,305.

On the right, at the head of the branch, $\frac{7}{8}$ mile up it, an unfinished prospect gives the following section, subject to correction:

Flag Coal.

Sandstone.	
Coal	39"
Clay	3"
Coal	5"
Shale	5"
Coal	24"
Altitude, 1445.	

On the right, $2\frac{3}{4}$ miles up Big branch, a closed opening gives the following:

Fire-clay Coal.

Shale	2 ft.
Jack-rock	4"
Shale	8"
Coal	1 to 2 ft.
Altitude, 1125.	

The jack-rock is not the flint-clay of the usual parting of this bed, but it seems quite probable that it is a substitute for it here. A similar substitution where it actually is a parting is known to have occurred near the head of Redbird creek in Bell county.

The widening of the valley above Road fork seems to indicate a change of dip of strata from an up-stream rise below the fork to down-stream rise above it, and this view is strengthened by the heights of the coals found on the Right fork.

RIGHT FORK—On the right, $3\frac{3}{4}$ miles up Big creek. Altitude of mouth, 1,160.

On the left and left of the road across the ridge, $\frac{1}{8}$ mile up the fork, Thomas Terry has a long entry with the following bed section 4 yards in:

Haddix (?) Coal.

Sandstone	10 ft.
Coal	1"
Shale	1"
Coal	7"
Shale	9"
Coal about	26"
Altitude, 1280.	

On the left of a left drain, $\frac{1}{8}$ mile up it, $\frac{1}{2}$ mile up the right fork, Jabel Richie has an unfinished covered prospect into the Haddix bed said to have 36 inches of coal with a six-inch parting 6 inches from the top. Its altitude is 1,285.

An outcrop on the left of the road, $\frac{1}{2}$ mile up the fork, shows 10 inches of coal on a clay floor and under 4 feet of massive sandstone. This seems to be of the Flag bed (with possibly more coal below the floor), and is at altitude 1,390.

The high gap to Montgomery branch is at altitude 1,490.

On a left branch, $5\frac{5}{8}$ miles up Balls fork, on the left, $\frac{3}{8}$ mile up the branch (on its right fork), Hiram Richie has a ten-yard entry of the following section, the upper parting and seam of coal (not mined) measured at the mouth of the entry, the rest of the section at its face:

Flag Coal.

Coal	6"
Shale	1"
Coal	9"
Shale	5"
Coal	18"
Shale	11"
Coal	18"

Altitude, 1230.

A ten-foot sandstone cliff is 50 feet above the coal. A small bench is 30 feet and a broad one 60 feet under the coal, the latter probably a little below the Hazard bed.

ZACH BRANCH.

On the left, $5\frac{3}{4}$ miles up Balls fork. Altitude of mouth, 930.

On a left branch of Zach branch, $\frac{5}{8}$ mile up it, on the left, $\frac{1}{8}$ mile up the left branch, is a twelve-yard entry, with the following section at its mouth, the upper parting and coal seam not mined:

Flag Coal.

Earth.	
Coal	6"
Shale	1"
Coal	8"
Bituminous shale	5"
Coal	20"
Bituminous shale	10"
Coal	20"

Altitude, 1250.

On a left branch, with mouth at altitude 945, $6\frac{3}{4}$ miles up Balls fork, on the right, $\frac{1}{2}$ mile up the branch, is a four-yard entry having 25 to 28 inches of coal under 4 feet of sandstone. This is of the Haddix bed, at altitude, 1,130.

RATTLESNAKE BRANCH.

On the left, 8 miles up Balls fork. Altitude of mouth, 955.

On the left at stream level, $\frac{5}{8}$ mile up (on the left fork), is 29 inches or more of Haddix coal under 2 feet of sandstone containing two thin seams of coal and at altitude 1,110.

On the left of a left branch, 11 miles up, and on the left of the road to Buckhorn creek, Bud Dobson has a thirty-yard entry of the following section, the lower 34 inches of coal and the parting measured at the face, the remainder (not mined) at the mouth of the entry:

Flag Coal.

Earth.	
Shale	6"
Coal and shale	2 ft.
Shale	7"
Coal	18"
Hard clay with coal ..	5"
Soft clay	5"
Coal	16"
Clay.	
Altitude, 1300.	

In the entry the coal rises northward at a rate of nearly 10%, but, though cliffs along the branch indicate the same, this condition cannot extend far. On the hill below the entry is a forty-foot broken cliff at altitude 1,230, under which must lie the Hazard bed. A bench at altitude 1,175 indicates the location of the Haddix bed.

LAUREL CREEK.

On the right, $11\frac{5}{8}$ miles up Balls fork. Altitude of mouth, 1,010.

On the left, 1 mile up, rising from the creek, at altitude 1,105, is 40 feet of shale, close below which should be the Hamlin bed.

On the right, $1\frac{1}{2}$ miles up, the Haddix cliff, 10 to 15 feet high, is easily recognized, with its base estimated at 1,185.

On the left, $1\frac{3}{4}$ miles up, an abandoned entry, under 4 feet of shale and then 4 feet of alternating sandstone

and shale, shows the Haddix bed to be some 3 feet thick. Its altitude is 1,205.

On a left branch, 2 miles up the creek, with altitude of mouth 1,150, on the left $\frac{3}{8}$ mile up the branch, W. F. Gearheart has a partly closed opening into the Haddix bed at altitude 1,230. About $11\frac{1}{2}$ feet of coal is in sight, with probably a foot more under water. The coal is covered by $11\frac{1}{2}$ feet of shale and then 10 feet of sandstone.

HARD BRANCH.

On the right, $12\frac{3}{4}$ miles up Balls fork. Altitude of mouth, 1,020.

At a right branch, $\frac{1}{4}$ mile up Hard branch, and $\frac{1}{4}$ mile up the right branch, J. S. Combs has a six-yard partly closed entry into the Haddix bed, at altitude 1,200, having somewhat over 2 feet of coal under 2 feet of shaly sandstone and then 3 feet of massive sandstone.

On the right, $13\frac{1}{4}$ miles up Balls fork, Peyton Richie has a five-yard entry with the following bed section at its face:

Flag Coal.

Shale	15 ft.
Coal	8"
Bituminous shale	8"
Coal	21"
Shale	12"
Coal	11"
Clay	10"
Altitude, 1350.	

OLD TRACE BRANCH.

On the left, $13\frac{1}{4}$ miles up Balls fork. Altitude of mouth, 1,030.

On the right of a right branch, $11\frac{1}{2}$ miles up Old Trace, on the right, $\frac{1}{8}$ mile up the right branch, William Messer has a ten-yard entry with the following section, the coal measured at the face of the entry:

Hazard Coal. (?)

Shale	3 ft.
Clay	1½ ft.
Shale	3½ ft.
Coal	52"
Covered	2 ft.
Massive sandstone	3 ft.
Altitude, 1360.	

The high gap at the head of this right branch is at altitude 1,475.

A gray limestone about 6 inches thick shows in this branch, ⅜ mile up it, at altitude 1,135.

OLDHOUSE BRANCH.

On the right, 13⅜ miles up Balls fork. Altitude of mouth, 1,030.

On the right, ½ mile up this branch, James M. Grigsby has a twelve-yard entry with the following bed section at its face:

Haddix Coal.

Massive sandstone	5 ft.
Shaly sandstone,	
("Draw slate")	6"
Shale with coal	2"
Coal	28"
Shale	7"
Coal	9"
Hard black shale 3 to 4"	
Altitude, 1230.	

A foot of coal is reported under the floor of the entry and another bed (the Young coal) 30 feet above it.

On the left of Ball fork, opposite the mouth of Oldhouse branch, a black, slaty, fossil limestone lies at altitude, 1,080. The Fire-clay coal should be here, about at the level of the creek—1,030.

TRACE BRANCH.

On the right at Vest, 13¾ miles up Balls fork. Altitude of mouth, 1,035.

In a right hollow $\frac{1}{4}$ mile up Trace branch, on the left, $\frac{1}{8}$ mile up the hollow, is a ten-yard entry with the following bed section 1 yard in:

Haddix Coal.

Sandstone	2 ft.
Clay	1"
Coal	24"
Bituminous shale	3"
Coal	6"
Altitude, 1255.	

On a right branch, with mouth at altitude 1,100, 1 mile up Trace branch, on the left, $\frac{3}{8}$ mile up the branch, Joseph Sutton has a four-yard entry into the Haddix bed at altitude 1,250, with 28 inches of coal at its face. Under this coal is 5 inches of black shale and then 5 inches or more coal (in water). Two feet of massive sandstone covers the bed. A bench probably of the Young coal shows above the entry at altitude 1,280.

In Trace branch, 1 mile up, is 8 inches of shale containing two one-inch seams of coal of the Hamlin bed, under sandstone, at altitude 1,100.

On a right branch, with mouth at altitude 1,150, $1\frac{1}{2}$ miles up Trace branch, on the right, $\frac{1}{4}$ mile up the right branch, Daniel Fugate has a twelve-yard entry into the Haddix coal, 25 inches thick at the mouth, 22 inches at the face. This lies upon 1 foot of clay, is covered by 3 feet of massive sandstone and is at altitude 1,275.

On the right, $1\frac{3}{4}$ miles up Trace branch, a prospect gives the following:

Francis Coal.

Earth.	
Coal stain	4"
Shale	8"
Coal	4"
Shale	5"
Coal	5"
Shale	8"
Coal	18"
Shale	16"
Coal	11"
Altitude, 1460.	

On the right, $\frac{1}{8}$ mile from the gap, on a broad bench on top of the ridge, a pit has been dug, through 3 feet of shale, into a coal bed 4 feet or more thick, in which 3 feet of coal was seen. Probably considerably thicker coal would be found under solid cover. The altitude is 1,585. This is of the Hindman bed, the bench of the Francis bed showing at altitude 1,510.

POND BRANCH.

On the right, $14\frac{3}{4}$ miles up Balls fork. Altitude of mouth, 1,045.

In a left hollow, $\frac{3}{8}$ mile up the branch, at the head, $\frac{1}{8}$ mile up the hollow, Lewis Evans has an eight-yard wet entry with the following section at its mouth:

Flag Coal.

Shale	12 ft.
Coal	6"
Shale	3"
Coal	5"
Shale	8"
Coal	18"
Shale	13"
Coal	18"
Altitude, 1365.	

On a left branch, $\frac{1}{8}$ mile up Pond branch, on the right $\frac{1}{8}$ mile up the left branch, John Ooten has a four-yard entry with the following section at its mouth:

Haddix Coal.

Sandstone	8 ft.
Coal	4"
Shale (with coal)	6"
Coal	22"
Altitude, 1255.	

In a right hollow, $\frac{5}{8}$ mile up Pond branch, on the left, $\frac{1}{8}$ mile up it, John Ooten has a prospect with the following section:

Haddix Coal.

Sandstone	4 ft.
Black shale with concretions	2½ ft.
Coal	2"
Shale	12"
Coal	3"
Shale	14"
Coal	3"
Shale	8"
Coal	7"
Shale	3"
Coal possibly	24"
Altitude, 1250.	

Comparing this with the preceding section it is plain that the lower 3 feet and cap-rock are about the same in each. A flag-stone quarry is below the latter opening, at altitude 1,240. The base of a tower rock 30 feet high is at altitude 1,555, and peaks rise to a height of about 1,630. The Hindman coal should be at about altitude 1,510.

On a right branch, with mouth at altitude 1,145, $\frac{3}{4}$ mile up Pond branch, on the left, $\frac{1}{4}$ mile up the right branch, Rebecca Terry has a four-yard entry with the following section at its mouth:

Francis Coal.

Shaly sandstone	2 ft.
Shale	1½ ft.
Coal	6"
Shale	2½ ft.
Coal	6"
Shale	11"
Coal	3"
Shale	4"
Coal	8"
Shale	5"
Coal	18"
Black slate	8"
Shale	8"
Coal	13"
Altitude, 1460.	

On the left, 1 mile up Pond branch, on the left of a left drain and of the trail to the top of the hill, Bud Terry has a twelve-yard entry with the following section at its face:

Haddix Coal.

Sandstone	3 ft.
Shaly sandstone	1 ft.
Sandstone	4 ft.
Coal	4"
Shale	8"
Coal	4"
Cannel coal	6"
Shale	7"
Coal	18"
Altitude, 1290.	

On the left of the branch and right of the trail, 1¼ miles up, a prospect gives the following:

Haddix Coal.

Sandstone	4 ft.
Coal	3"
Shale	3"
Coal	7"
Shale	6"
Coal	18"
Altitude, 1315.	

The cannel of the preceding entry is here a hard block coal.

The high gap at the head of the branch is at altitude 1,565, about the level of the Hindman coal. A bench at altitude 1,615 near the top of the ridge indicates a still higher bed.

KNOB BOTTOM BRANCH.

On the left, 15 miles up Balls fork. Altitude of mouth, 1,050.

In this branch, ½ mile up it, is the following exposure, with measures approximate:

Fire-clay Coal Rider. (?)

Thick shale.

Black shale 6"

Fossil limestone 2"

Black shale 6"

Coal 2"

Black slate 4"

Altitude, 1140.

On the right of the branch and left of the road, $1\frac{1}{4}$ miles up, an eight-yard entry gives the following bed section half way in:

Flag Coal.

Sandstone 5 ft.

Coal 6"

Shale 7"

Coal 18"

Black slate 7"

Shale 5"

Coal 13"

Altitude, 1380.

A thirty-foot cliff over the entry is at altitude 1,410. The correlation assumed for this opening is based only on its section and height, which might serve also to identify it as of the Francis bed.

On the right, $15\frac{1}{8}$ miles up Balls fork, Elhannon Gearhart has a closed entry into the Haddix bed at altitude 1,230.

Above the preceding opening he has a twelve-yard entry with the following bed section at its face:

Flag Coal.

Shale 10 ft.

Shaly sandstone 2 ft.

Clay shale 3 ft.

Coal 5"

Shale 3"

Coal 8"

Shale 5"

Coal 18"

Shale (with coal) 13"

Coal 17"

Altitude, 1350.

GARDEN BRANCH.

On the left, $15\frac{3}{8}$ miles up Balls fork. Altitude of mouth, 1,055.

On the left, $\frac{1}{4}$ mile up this branch, a closed entry shows the Flag bed, at altitude 1,365, to have about 5 feet thickness and to include some black slate. Over the bed is 5 feet of shale, then 2 feet of sandstone, and 40 feet higher is a fifty-foot cliff.

SAND LICK BRANCH.

On the right, $15\frac{3}{4}$ miles up Balls fork. Altitude of mouth, 1,060.

On the right, $15\frac{1}{8}$ miles up this branch is an opening with the following section:

Haddix Coal.

Massive sandstone	8 ft.
Shaly sandstone	2"
Coal	5"
Clay	6"
Coal	2"
Slaty cannel coal	6"
Black slate and shale	15"
Coal	22"
Altitude, 1265.	

On the right, $13\frac{1}{4}$ miles up the branch, is a closed entry into the same bed at altitude 1,290.

A spring above the preceding entry appears to indicate a coal bed at altitude 1,390, about the height of the Flag coal.

Still higher on the hill Lewis Gearheart has a four-yard entry with the following bed section:

Francis Coal.

Sandstone	5 ft.
Covered	15 ft.
Clay	1 ft.
Coal	5"
Shale	6"
Coal	14"
Shale	4"
Coal	2"
Shale	6"
Coal	11"
Altitude, 1475.	

The similarity of the sections of the Flag and Francis coals on Sand Lick, Pond and Trace branches is remarkable. Comparing these with the sections of the Hazard and Flag beds on the head of Long fork of Buckhorn creek, it would seem that the correlation of the two pairs of beds was justified, but it has not been found that such correlation would answer in other respects.

On the left, 16 miles up Balls fork, William Stewart has a prospect with the section following:

Flag Coal.

Clay	5 ft.
Coal	6"
Shale	4"
Coal	5"
Shale	7"
Coal	22"
Black slate and shale	16"
Coal	16"
Altitude, 1385.	

STEWART (TERRY) FORK.

On the right, 16 miles up Balls fork. Altitude of mouth, 1,065.

On the right, $\frac{7}{8}$ mile up the fork, William Stewart has a ten-yard entry with the following bed section at its face:

Flag Coal.

Sandstone	4 ft.
Covered	5 ft.
Shale	5 ft.
Coal (2 thin part- ings)	12"
Shale	15"
Coal	8"
Black slate	2"
Shale	6"
Coal	15"
Shale	14"
Coal	16"
Altitude, 1430.	

A broad bench, at altitude 1,295, under the entry, is indicative of an interval of about 130 feet from the Flag to the Haddix coal.

In the fork, 1 mile up it, coal 8 inches thick, in massive sandstone, at altitude 1,110, is about at the level of the Fire-clay coal.

On the left, $\frac{1}{8}$ mile up a left hollow, $16\frac{1}{4}$ miles up Balls fork, Martha Gearhart has a closed entry, with 4 feet of shale covering, in which $11\frac{1}{2}$ feet of coal was seen and 3 feet reported. It is of the Hazard bed at altitude 1,360 and lies about 30 feet under the Flag bed, opened at altitude 1,385 across the spur.

On the left, $\frac{1}{8}$ mile up a left hollow, $16\frac{7}{8}$ miles up Ball's fork, Green Bowling has a closed entry with the following section:

Hazard Coal.

Sandstone	15 ft.
Coal about	5"
Shale	$1\frac{1}{2}$ ft.
Coal (in water)	1 ft. or more
Altitude, 1370.	

A bench 40 feet over the entry indicates the place of the Flag bed to be at altitude about 1,420.

At the head of a left hollow, 17 miles up Balls fork, Green Bowling has a 12-yard entry with the following bed section at its face:

Flag Coal.

Sandstone	6 ft.
Shaly sandstone	1 ft.
Coal	5"
Shale	4"
Coal	4"
Shale	5"
Coal	12"
Bituminous shale	13"
Coal	13"
Altitude, 1445.	

A 20-foot cliff lies 40 feet over the entry and benches are plain at altitudes 1,435, 1,345 and 1,190, from which it is judged that coals lie at about the following altitudes:

Flag	1445
Hazard	1365
Haddix	1295
Hamlin	1195

GEARHART (MILL) BRANCH.

On the left, 17 miles up Balls fork: Altitude of mouth, 1,080.

On the right, at the mouth of this branch, and 15 feet above it, 15 feet of sandstone is exposed with 30 feet of shale above that.

CONLEY (LITTLE) BRANCH.—On the left, $\frac{1}{8}$ mile up Mill branch; Altitude of mouth, 1,085.

At this branch, $\frac{3}{8}$ mile up it, is 6 inches of coal under 3 feet of black slate and then 15 feet of shale at altitude 1,140, possibly the rider to the Fire clay coal.

From the forks of the branch, 1 mile up it, with altitude of mouth 1,200, on the left, $\frac{1}{8}$ mile up a left hollow, John Conley has a 12-yard entry with the following bed section at its face:

Flag Coal.

Sandstone	2 ft.
Shale	3 ft.
Coal	6"
Knife-edge parting.	
Coal	5"
Shale	4"
Coal	2"
Shale	6"
Coal	22"
Shale	12"
Coal	18"
Altitude, 1390.	

On the right of the right fork, at its mouth, a 2-yard entry gives the following bed section at its face:

Flag Coal.

Massive sandstone	4 ft.
Coal	4"
Knife-edge parting.	
Coal	4"
Bituminous shale	8"
Coal	22"
Shale, Bituminous slate, over	12"
Coal in water and not seen.	
Altitude, 1400.	

On a left branch, $\frac{3}{8}$ mile up Gearhart branch, on the right, $\frac{1}{4}$ mile up the left branch, a 12-yard entry gives the following bed section at its face:

Flag Coal.

Massive sandstone	9 ft.
Coal	10"
Bituminous shale	6"
Coal	19"
Bituminous shale	12"
Coal	15"
Altitude, 1410.	

The bench of the Haddix coal is seen at altitude 1,275.

On the left, $1\frac{3}{4}$ miles up Gearhart branch, the Hazard coal, said to be 30 inches thick, lies under 2 feet of sandstone and 20 feet above a cliff, at altitude 1,365.

On the right, $17\frac{1}{2}$ miles up Ball's fork, Joseph Patten has a five-yard entry with the following bed section at its face:

Flag Coal.

Massive sandstone	6 ft.
Coal	1'
Knife-edge parting.	
Coal	4"
Shale	4"
Coal	5"
Bituminous shale	6"
Coal	16"
Bituminous shale	13"
Coal	12"
Altitude, 1420.	

BUCK BRANCH.

On the left, $17\frac{3}{4}$ miles up Balls fork: Altitude of mouth, 1,090.

On the left, $\frac{1}{4}$ mile up this branch, Allen Gearhart has a four-yard entry with the following bed section at its face:

Flag Coal.

Shale	5 ft.
Coal	3"
Bituminous shale	4"
Clay shale	4"
Coal	13"
Clay shale	4"
Coal	3"
Clay shale	18"
Coal (in water)	
about	17"
Altitude, 1375.	

In the branch, $\frac{1}{2}$ mile up it, is 3 inches of coal under 4 inches of black slate, in shale, at altitude 1,225, probably a part of the Haddix bed.

On the left, $\frac{3}{4}$ mile up the branch, William Bowling has a two-yard entry with the following bed section:

Flag Coal.

Shale	4 ft.
Coal	3"
Shale	10"
Coal	11"
Shale	6"
Coal	15"
Bituminous shale	14"
Coal (in water) about	12"
Altitude, 1415.	

WILEY BRANCH.

On the right, $18\frac{1}{4}$ miles up Balls fork: Altitude of mouth, 1,100.

On a right branch, $\frac{1}{4}$ mile up Wiley branch, on the right, $\frac{1}{4}$ mile up the branch, Elijah Combs has a partly closed prospect with the following approximate section:

Flag Coal.

Sandstone	15 ft.
Shaly sandstone with coal	1 ft.
Coal	$1\frac{1}{2}$ ft.
Shale	3 ft.
Coal	1 ft.
Shale	1 ft.
Coal visible (report- ed 3 feet)	$1\frac{1}{2}$ ft.
Altitude, 1390.	

Under the preceding is a wholly closed prospect into the Hazard coal at altitude 1,335, reported to have about 33 inches of coal with a 2-inch parting near the middle.

On the left, $\frac{1}{2}$ mile up the branch, Richard Smith has a wet entry with the following section at its mouth:

Hazard Coal.

Massive sandstone	2 ft.
Clay	5"
Coal	15"
Shale	11"
Shale and coal	11"
Altitude,	1415.

Openings into the Hazard and Flag beds, $\frac{1}{2}$ mile above the mouth of Wiley branch, prove this of the Hazard bed, notwithstanding the sharp rise it involves from the Elijah Combs openings just given.

In a left hollow, $\frac{5}{8}$ mile up the fork, Grant Moore has a wet entry with the following section at its mouth:

Hazard Coal.

Sandstone	5 ft.
Coal	14"
Shale	10"
Coal	16"
Altitude,	1415.

COMBS FORK.—On the right, $\frac{3}{4}$ mile up Wiley branch: Altitude of mouth, 1,125.

Hurricane branch is on the right, $\frac{3}{4}$ mile up Combs fork: Altitude of mouth, 1,155.

In the branch, $\frac{1}{8}$ mile up it, is a thin coal (so far as seen) at altitude 1,180. This is either of the Fire-clay coal bed or its rider.

On the right, $\frac{1}{4}$ mile up the branch, Solomon Sloane has a one-yard entry with the following section:

Flag Coal.

Sandstone	4 ft.
Coal	5"
Shale	16"
Coal	10" to 12"
Shale with coal	16"
Hard block coal	17"
Altitude,	1480.

A 15-foot cliff is above the entry at altitude 1,530.

GEORGES BRANCH.—On the right, $1\frac{1}{8}$ miles up Wiley branch: Altitude of mouth, 1,150.

At the branch, $\frac{3}{8}$ mile up it, is a thin coal under 1 foot of sandstone and with 15 feet of sandstone 10 feet above it. This, at altitude 1,235, appears to be of the Fire-clay coal rider.

On the left, $\frac{3}{4}$ mile up the branch (on the right fork) Wes Hicks has an opening with the following section:

Flag Coal.

Laminated sand-	
stone	1½ ft.
Coal	5"
Shale with coal	5"
Coal	20"
Hard clay with	
coal	15"
Coal	20"
Altitude, 1545.	

On a left branch with altitude of mouth, 1,200, 2 miles up Wiley branch, at the head of a drain $\frac{3}{4}$ mile up the branch, Benjamin Terry has a six-yard entry with the following bed section two yards in:

Francis (?) Coal.

Shale	3 ft.
Coal	11"
Shale	8"
Coal	18"
Hard clay with	
coal	15"
Coal (half in water) ..	14"
Altitude, 1585.	

On the left of Wiley branch, at the road $2\frac{3}{4}$ miles up the fork, $\frac{1}{4}$ mile from the gap to Jones fork, John Smith has a four-yard entry with the following bed section at its face:

Hazard (?) Coal.

Laminated sand-	
stone	3 ft.
Coal	16"
Hard bone coal	4"
Coal ? (in water)	4"
Altitude, 1440.	

It is quite possible that there is more coal under the floor of the entry.

The altitude of the gap is 1,475.

On the right, $18\frac{3}{4}$ miles up Balls fork, John L. Triplett has a two-yard entry with the following bed section half way in:

Hazard Coal.

Sandstone	3 ft.
Coal	12"
Shale	2"
Hard block coal	19"
Altitude, 1400.	

Above the entry he has a partly closed prospect into the Flag coal at altitude 1,470. The bed is better shown in a prospect on Thomas Triplett's land, 100 yards farther up stream, where it has the following bed section:

Flag Coal.

Sandy shale	4 ft.
Coal stain	5"
Clay	$\frac{1}{2}$ "
Coal	11"
Black shale	8"
Coal	5"
Shale	18"
Coal	16"
Altitude, 1470.	

BOWLING FORK.

On the right, $18\frac{7}{8}$ miles up Balls fork: Altitude of mouth, 1,140.

On a left branch, with mouth at altitude 1,250, on the right, $\frac{1}{8}$ mile up the branch, is a sixteen-yard entry with the following bed section half way in:

Hazard Coal.

Sandstone	5 ft.
Clay	2"
Coal	12"
Shale	4"
Coal	17"
Altitude, 1405.	

This is 30 feet above its bench.

Across the divide, $\frac{1}{4}$ mile north of the gap to the head of Long branch of Jones fork of Beaver creek, at the mouth of a long wet entry is the following:

Flag Coal.

Shale	5 ft.
Coal	5"
Shale	6"
Coal	12"
Shale about	15"
Coal about	12"
Altitude, 1510.	

LONG FORK.

On the left, $19\frac{3}{4}$ miles up Balls fork: Altitude of mouth, 1,200.

On the right, $\frac{5}{8}$ mile up this fork, is a covered prospect on the broad point of a spur said to have shown 44 inches of coal without parting. Black shale on the dump, which may have been mistaken for coal, came from a parting probably. The coal is of the Flag bed, at altitude 1,420.

LITTLE BALL FORK.

On the left, 24 miles up Troublesome creek: Altitude of mouth, 840.

On the left of a right hollow, Jasper Stacy has a sixteen-yard entry, $\frac{1}{4}$ mile from the creek, with the following bed section 10 yards in:

Hazard Coal.

Laminated sand-	
stone	10 ft.
Shaly sandstone	4 ft.
Coal	33"
Shale	3"
Coal	33"
Altitude, 1245.	

The bench of the Haddix coal is at altitude 1,125 and the stain of the Hamlin coal shows in the road to

the entry at altitude 1,045. At altitude 945 is the bench of the Fire-clay coal.

PIGEON-ROOST BRANCH.

On the right, $2\frac{7}{8}$ miles up Troublesome creek: Altitude of mouth, 845.

On a right branch, $\frac{1}{8}$ mile up Pigeon-Roost branch, on the left, $\frac{3}{8}$ mile up the right branch, Lark Smith has a closed ten-yard entry into the Hazard bed at altitude 1,250, said to be 8 feet thick, but showing only 8 inches of coal on 10 inches of shale at the top of the bed. (S.)

COALSTONE BRANCH.

On the left, $\frac{5}{8}$ mile up Pigeon Roost branch, altitude of mouth, 905.

At the mouth of Coalstone branch is a seam of the Whitesburg bed, 9 inches of coal under sandstone at altitude 910.

On a left branch, $\frac{1}{2}$ mile up Coalstone branch, on the right, $\frac{1}{8}$ mile up the left branch, Joseph Stacy has an eight-yard entry with the following bed section, the bottom coal measured at its face:

Hazard Coal.

Earth.	
Coal and shale	16"
Coal	29"
Clay	1"
Sandstone	13"
Shale	3"
Coal	50"
Altitude, 1255. (S.)	

The sandstone parting suggests that the considerable coal above is of the Flag bed: A junction of the two beds is believed to be complete at one point on Balls fork.

On the left, $\frac{7}{8}$ mile up Pigeon-Roost branch, the Hazard bed, said to be 7 feet thick, is at altitude 1,280.

At the head of a left branch, $\frac{7}{8}$ mile up Pigeon-Roost branch, on the right, $\frac{1}{2}$ mile up the left branch, Elkanah Stacy has an entry with the following section:

Hazard Coal.

Shale.	
Coal	34"
Clay, thin.	
Coal	53"
Coal (reported)	
about	12"
Altitude, 1250. (S.)	

RIGHT FORK.

On the right, $1\frac{1}{4}$ miles up the branch: Altitude of mouth, 960.

On the right, $\frac{1}{2}$ mile up this fork, James Stacy has a three-yard entry with the following section at its mouth:

Hazard Coal.

Shale.	
Coal	9"
Shale	2"
Coal	80"
Altitude, 1230. (S.)	

LEFT FORK.

On the left, $1\frac{1}{4}$ miles up the branch: Altitude of mouth, 960.

On the left, $\frac{1}{8}$ mile up the fork, an opening gives the Hazard bed at altitude 1,270, with the same section as the preceding, excepting that the bottom coal is only 61 inches thick. (S.)

On a left branch, $\frac{1}{2}$ mile up the fork, on the right, $\frac{1}{4}$ mile up the branch, William Smith has an entry with the following bed section:

Hazard Coal.

Shale	10 ft.
Black slate	4"
Coal	52"
Clay.	
Altitude, 1255. (S.)	

On a right branch, with altitude of mouth 1,115, 1 mile up the fork, on the right, $\frac{1}{8}$ mile up the branch, Samuel Bush has a now closed entry into the Flag (or Francis) coal at altitude 1,380, showing a bed about 6 feet thick, 3 feet visible, under 6 feet of shale and then 25 feet of sandstone.

Coal showing in the road to this entry at altitude 1,190 is of the Haddix bed.

On the right, $1\frac{1}{8}$ miles up the left fork, Samuel Bush has a five-yard entry with the following bed section at the face:

Hazard Coal.

Earth.	
Coal stain.	
Shale	5 ft.
Coal	44"
Altitude, 1280.	

The coal stain above the entry may be of the Flag bed, thin seams of coal in the shale covering the Hazard bed being uncommon only at such distance from the main seam. If of the Flag bed, the preceding entry at altitude 1,380 is of the Francis bed.

On the left, 2 miles up the fork, William Brewer has a ten-yard entry into the Hazard bed at altitude 1,280, with 47 inches of coal at the face, under 10 feet of shale.

A former William Brewer entry gave the following:

Flag Coal.

Sandstone and shale....	5 ft.
Shale	5 ft.
Coal	32"
Hard parting with	
coal	6" to 9"
Shale	6"
Coal	9"
Shale	7"
Coal	5"

The altitude previously obtained is 1,270, but the opening is undoubtedly above the one preceding this

and is probably the now Samuel Bush entry at altitude 1,380.

On the right, $25\frac{1}{2}$ miles up Troublesome creek, the following is exposed:

Whitesburg Coal.

Sandstone	15 ft.
Coal	15"
Shale, thin.	
Sandstone	20 ft.
Coal	3"
Altitude at base, 850.	

COLES BRANCH.

On the left, $25\frac{1}{2}$ miles up the creek: Altitude of mouth, 850.

On the left, $\frac{1}{2}$ mile up the branch, an entry gives the following bed section:

Hazard Coal.

Shale	10 ft.
Coal	5 ft.
Clay	2"
Coal	3 ft.
Clay	3 ft.
Altitude, 1220.	

The upper 2 feet of coal is not mined. The 3-foot seam, excepting the lower 3 inches, is in one block with 4 inches of bony coal in the middle.

On the right, $\frac{3}{4}$ mile up the branch, George Combs has a five-yard entry with the following section, the upper seam of coal not mined, the remainder measured at the face:

Flag Coal.

Coal	27"
Clay	1"
Block coal	14"
Bituminous shale	15"
Block coal	24"
Altitude, 1250.	

The former of these two openings is on a good bench, the latter on a long smooth slope. Open fields permit a view from one to the other and the possibility was evident that the two might be of the same bed in spite of their differing sections. To determine this the floor of the Hazard bed was penetrated to a depth of 3 feet to prove that it was not a parting, slipped coal lower down beside the entry indicating that possibility. In further proof, following the bench from the Hazard opening down stream, $\frac{1}{8}$ mile, a wholly closed opening, reported thick coal without parting, is at the same altitude, 1,220. A further following of the bench leads to a break in it, but in another $\frac{1}{8}$ mile, one appears at altitude 1,210 and an opening above it, reported with a large parting, lies at altitude 1,225. The first three openings are nearly on an east and west line, the last one northwest of the third, down the general dip of strata. The two intermediate openings, without material partings, are therefore considered proven to be about 25 feet below the other two which have several partings.

LAUREL LICK BRANCH.

On the left, $26\frac{1}{4}$ miles up the creek: Altitude of mouth, 860.

To the forks, $\frac{3}{8}$ mile up this branch, and thence on the right, $\frac{1}{8}$ mile up the right fork, Albert Engle has a twenty-yard entry with the following bed section half way in, only the main seam of coal mined:

Hazard Coal.

Shale.	
Coal about	18"
Clay	1"
Coal about	12"
Shale about	4"
Coal	68"
Altitude, 1240. (S.)	

On the left, $26\frac{3}{8}$ miles up Troublesome creek is the following exposure:

Whitesburg Coal.

Sandstone	20 ft.
Shale	1 ft.
Sandstone	1 ft.
Black slate	5"
Coal	18"
Altitude, 885. (S.)	

An inch of the coal one foot from the bottom is bone coal.

On a right branch, $26\frac{5}{8}$ miles up the creek, $\frac{1}{4}$ mile up the branch, Albert Engle has a seven-yard entry showing, in part, the following bed section:

Hazard Coal.

Shale	$2\frac{1}{2}$ ft.
Coal	8"
Shale	10"
Coal	7 ft.
Altitude, 1245. (S.)	

The lower $1\frac{1}{2}$ feet was not seen.

On the left, $27\frac{1}{4}$ miles up the creek, the Whitesburg bed at altitude 885, is exposed with section similar to that a mile down stream, but with a total of 22 inches coal.

BEAR BRANCH.

On the left, 28 miles up the creek: Altitude of mouth, 875.

On a right branch, $\frac{1}{2}$ mile up Bear branch, on the left, $\frac{1}{8}$ mile up the right branch, at the head of a drain, is $3\frac{1}{2}$ feet of coal under 10 feet of sandstone, of the Hazard bed at altitude 1,275.

COMBS BRANCH.

On the right, 29 miles up Troublesome creek: Altitude of mouth, 885.

By the school house at the forks, $\frac{1}{4}$ mile up this branch, the Whitesburg bed has 23 inches of coal with black slate roof under 50 feet of sandstone, at altitude 905.

RIGHT FORK.

On the right, $\frac{1}{4}$ mile up Combs branch: Altitude of mouth, 905.

On the left of a left drain, $\frac{1}{2}$ mile up this fork, a long entry gives the following bed section, 8 yards in:

Hazard Coal.

Massive sandstone	5 ft.
Shaly sandstone	2 ft.
Coal	1"
Bituminous shale	4"
Coal	49"
Altitude, 1265.	

Of the 49 inches coal, the top 9 inches is in one block, the next 24 inches is soft coal and the bottom 16 inches hard.

In the fork, $\frac{3}{4}$ mile up it, is 5 inches of coal under 10 feet of dark shale and then 10 feet of hard sandstone. This at altitude 1,015, is probably not a continuous bed, the Fire-clay coal being, most likely, on top of the hard sandstone. Above the sandstone soft shales are exposed along the creek through most of the interval to within 20 to 30 feet of the Haddix coal, under which is the usual hard sandstone.

On the right, $1\frac{1}{4}$ miles up the fork, James Stacy had openings from one of which, a prospect, the following was taken:

Haddix Coal.

Coal	16"
Bituminous shale	5"
Coal	9"
Shale	12"
Coal	34"
Altitude, 1140.	

On the left, at the same place, Mr. Stacy has an entry with the following bed section:

Hazard Coal.

Sandstone	4 ft.
Slate	4"
Shale	6"
Coal	50"
Altitude, 1250. (S.)	

Two feet of coal in the middle is soft, the remainder hard.

Across the ridge at the head of Combs branch, on Trace fork of Lots creek, the Haddix coal has been opened at altitude 1,150, the Hazard at 1,250 and the Flag at 1,310. No allowance for dip is necessary for ascertaining intervals here.

LEFT FORK.

On the left, $\frac{1}{4}$ mile up Combs branch: Altitude of mouth, 905.

At the head of a left drain, $\frac{1}{8}$ mile up the fork, Martha Cornett has a ten-yard entry with the following bed section at its face:

Hazard Coal.

Sandstone.	
Shale	2½ ft.
Black slate	2"
Coal	2"
Bituminous shale	1"
Coal	54"
Altitude, 1285. (S.)	

The mouth of a right branch, $\frac{1}{2}$ mile up the left fork is at altitude 940. It has forks $\frac{1}{2}$ mile up it, at altitude 1,030.

At the head of a right branch, $\frac{1}{8}$ mile up the right fork, William Engle has a five-yard entry into the Hazard bed at altitude 1,260, with 50 inches of coal (the lower 5 inches in water and not seen) under 5 feet of sandstone. (S.)

The left fork has forks $\frac{1}{2}$ mile up it at altitude 1,030. Thence to the head of the right fork, $\frac{1}{4}$ mile up, where Wade Combs has a two-yard entry with the following section:

Flag Coal.

Shale.	
Coal	7"
Shale	3"
Coal	27"
Hard shale	17"
Coal	12"
Shale	1"
Coal about	13"
Altitude, 1315. (S.)	

The upper 18 inches of the 27-inch coal seam is left as a roof. In an adjacent entry the upper 3-inch parting is absent. The partings indicate the Flag bed.

At the mouth of a left branch, with altitude 1,000, one mile up the main left fork, is exposed a coal 4 to 9 inches thick with clay covering and between bituminous sandstones. This, at altitude 1,005, may be of the Fire-clay coal bed.

On this left branch, at the head of its left drain, $\frac{1}{8}$ mile up, George Fugate has a ten-yard entry into the Hazard bed, at altitude 1,320, having, at its mouth, 55 inches of coal under shale with calcareous concretions. (S.)

At the mouth of a right drain, $\frac{5}{8}$ mile up this same left branch, is 2 feet of limestone at altitude 1,135.

On the right, at the head of this drain, J. B. Stamper has an eight-yard entry in which is the following bed section:

Hazard Coal.

Sandstone.	
Shale	2½ ft.
Coal	1"
Shale	1"
Coal	1"
Shale	2"
Coal	54"
Altitude, 1310. (S.)	

The thin seams of coal and clay at the top of the bed are rather typical of the Hazard coal.

Hog-Wallow branch is on the right, $1\frac{1}{2}$ miles up the main left fork; Altitude of mouth, 1,110.

On the left, $\frac{1}{4}$ mile up the branch, Harvey Owens has a long entry in which is the following section:

Hazard Coal.

Sandstone.	
Coal	1"
Shale	6"
Coal	52"
Altitude, 1290. (S.)	

On the right, $1\frac{7}{8}$ miles up the main left fork, J. B. Stamper has a four-yard entry giving the following section:

Hazard Coal.

Sandstone.	
Coal	1"
Shale	8"
Coal	52"
Altitude, 1295. (S)	

On the left, $29\frac{1}{4}$ miles up Troublesome creek, 15 feet above it, is the following coal with attendant exposure:

Whitesburg Coal.

Sandstone	15 ft.
Black slate	9"
Coal	24"
Clay	1 ft.
Sandstone	10 ft.
Altitude, 905.	

The coal seems to be of poor quality.

At the head of a right branch, $29\frac{1}{4}$ miles up the creek, C. C. Combs has a five-yard entry in which is the following bed section:

Hazard Coal.

Shale	2½ ft.
Coal (with clay)	2"
Coal	9"
Shale	5"
Coal	34"
Altitude, 1300.	

On the right, $29\frac{1}{4}$ miles up the creek, the Whitesburg bed, in an entry at altitude 905, has about 28 inches of coal under thin black slate and then thick sandstone.

On a right branch, $29\frac{3}{4}$ miles up the creek, in a knob at the head of a left drain, $\frac{1}{4}$ mile up the branch, Jerry Combs has an eighteen-yard entry with the following section at its face:

Hazard Coal.

Sandstone.	
Shale	1"
Coal	57"
Altitude, 1310. (S.)	

TRACE BRANCH.

On the left, $30\frac{1}{4}$ miles up the creek: Altitude of mouth, 900.

On the right, $\frac{1}{8}$ mile up this branch, the Whitesburg bed has about 15 inches of coal at altitude 920, under 6 inches of black slate and then 5 feet of sandstone.

On a right branch, $\frac{1}{2}$ mile up, on the right, $\frac{1}{8}$ mile up the right branch, the Engle heirs have a two-yard entry with the following bed section at its face:

Hamlin Coal.

Shaly sandstone	1 ft.
Coal	10"
Shale	4"
Coal	2"
Cannel coal	24"
Altitude, 1065.	

The upper half of the 10-inch seam is slaty and the rest bony. The upper half of the cannel coal appears good, the remainder slaty. A probably thin coal is exposed on the left of the branch, $\frac{1}{4}$ mile up, at altitude 1,025.

In Trace branch, $\frac{3}{4}$ mile up it, is 6 inches of coal under black slate at altitude 1,010. It probably represents the rider to the Fire-clay coal.

On a left branch at this point, on the left, $\frac{1}{4}$ mile up it, Jordan Combs has a twelve-yard entry into the

Hazard coal at altitude 1,280. The bed has 50 inches of coal, underlain by 6 inches of clay and has 6 feet of smooth sandstone covering. What appears to be the main bench of the hill is at altitude 1,225, the place of the Young bed. The gap to the head of Roaring branch of Balls fork, is at altitude 1,218.

On the left, $30\frac{3}{8}$ miles up Troublesome creek, the Whitesburg bed, at altitude 920, shows about 2 feet of coal under $1\frac{1}{2}$ feet of shale and then sandstone, the usual black slate roof of the upper seam having disappeared.

CLEAR CREEK.

On the right, $31\frac{1}{8}$ miles up Troublesome creek: Altitude of mouth, 910.

SHOP HOLLOW.

On the left at the mouth of Clear creek: Altitude of mouth, 910.

On the left, $\frac{1}{4}$ mile up the hollow, the Whitesburg bed, at altitude 950, has 15 inches of coal under 9 inches of black slate and then sandstone.

On the left at the head of a right drain, $\frac{3}{8}$ mile up the hollow, Bayliss Gearhart has a four-yard entry into the Hazard bed at altitude, 1,335, with 52 inches of coal at its face, one inch of which, in the middle, is bone coal. Eight feet of sandstone forms the roof. (S.)

RIGHT FORK.—On the right, $\frac{1}{2}$ mile up the hollow: Altitude of mouth, 1,025.

At the head of a right drain, $\frac{1}{8}$ mile up this fork, B. J. Combs has a twelve-yard entry into the Hazard bed at altitude 1,330, with one inch more coal than in the preceding. (S.)

On a right branch, $\frac{1}{4}$ mile up Clear creek, at the head of a left drain, $\frac{1}{8}$ mile up the branch, an opening into the Hazard bed at altitude 1,305 gives 53 inches of coal under sandstone. (S.)

A half mile up Clear creek, the Whitesburg bed, at altitude 940, and 10 feet above stream, has 26 inches of

coal under 9 inches of cannel slate and then sandstone. Fairly good cannel coal found farther up in the stream bed is supposed to have come from this coal bed, but no other instance is known of the Whitesburg bed having cannel coal.

LONG BRANCH.

On the left, $\frac{5}{8}$ mile up Clear creek: Altitude of mouth, 935.

The mouth of the right fork, one mile up the branch, is at altitude 1,185. On the left $\frac{1}{4}$ mile up this fork Alexander Francis has a ten-yard entry in the Hazard bed at altitude 1,385, with 50 inches of coal at the face and sandstone roof. (S.) A mile north of this point the Fire-clay coal is at altitude 1,005 and the Hazard coal at 1,355.

At stream level, 1 mile up Clear creek, the Whitesburg bed, under one foot of black slate and then sandstone, has 9 inches of coal at altitude 940.

COCKEREL TRACE.

On the right, one mile up Clear creek: Altitude of mouth, 945.

At stream bed, $\frac{1}{4}$ mile up, the Whitesburg bed shows again, under $11\frac{1}{2}$ feet of black slate and then sandstone, with 6 inches of coal at altitude 980.

On a right branch of Cockerel Trace, $\frac{5}{8}$ mile up it and with mouth at altitude 1,000, on the left, $\frac{1}{4}$ mile up the branch, Benjamin Richie has an eight-yard entry with the following bed section:

Hazard (?) Coal.

Sandstone	12 ft.
Shale	1 ft.
Coal	49"
Shale	3"
Coal	6"
Shale	7"
Coal	15"
Shale	2"
Coal	7"
Altitude, 1365. (S.)	

The upper foot of coal is left as a roof. The bottom block of the 49-inch seam is splint coal; the coal between the upper partings is said to be poor and the bottom block best of all.

On the left, one mile up Cockerel Trace, at the mouth of Gearhart fork, 15 feet above it, is a foot of coal and shale, probably of the Fire-clay coal rider, at altitude 1,115.

On the right, $1\frac{1}{4}$ miles up the trace, Joseph Richie has an unfinished prospect showing about 57 inches of coal under one foot of clay and then 5 feet of sandy shale, at altitude 1,385. This appears to be of the same bed as the preceding with the upper parting gone and possibly more coal below.

On a right branch with mouth at altitude 955, $1\frac{1}{4}$ miles up Clear creek, $\frac{1}{4}$ mile up the branch, the Richie heirs have a prospect with the following section:

Hazard Coal.

Sandstone.	
Coal and shale	1"
Shale	5"
Coal	48"
Altitude, 1345. (S.)	

In Clear creek, $1\frac{1}{2}$ miles up it, is a coal of the Whitesburg bed at altitude 970.

DICKS BRANCH.

On the right, $2\frac{7}{8}$ miles up Clear creek: Altitude of mouth, 1,015.

On this branch, $\frac{1}{2}$ mile up it, is a coal at altitude 1,065, either of the Fire-clay coal bed or near to it.

BUZZARDS BRANCH.—On the right, 1 mile up Dicks branch: Altitude of mouth, 1,120.

On the right, $\frac{1}{2}$ mile up this branch, coal, under 5 feet of shale, is at altitude 1,240. This is of the Had-dix bed.

On a left branch with mouth at altitude 1,140, $1\frac{3}{8}$ miles up Dicks branch, on the left, $\frac{1}{4}$ mile up the left branch, Joseph Richie has a fifteen-yard entry into the

Hazard bed at altitude 1,325, having 62 inches of coal, 5 yards in. Two feet of shale and then sandstone cover the coal.

In a left drain at the school house, $1\frac{7}{8}$ miles up Dicks branch, Samuel Smith has an eighteen-yard entry into the Hazard bed with 55 inches of coal at its face, at altitude 1,415. The roof is again 2 feet of shale, with 10 feet of sandstone above it.

On the right, at the head of the branch, 2 miles up it, Mr. Smith has another entry, 10 yards long with the same thickness of coal half way in it, and the same covering. Its altitude is 1,385. (S.)

The gap to Big fork of Lots creek, is at altitude 1,398. By the road, $\frac{1}{4}$ mile down Big fork, a six-yard entry, not heretofore reported, gives the same bed with 59 inches of coal half way in a six-yard entry, at altitude 1,400. The covering is like that of the preceding entry.

On the right, $3\frac{1}{8}$ miles up Clear creek, 10 feet above it, a seam of the Whitesburg bed 5 inches thick, under 30 feet of sandstone, is at altitude 1,055.

On the left branch with trail to Short branch, and with mouth at altitude 1,035, $3\frac{1}{4}$ miles up Clear creek, a prospect on the right of branch and trail, gives a foot of coal, under 10 feet of sandstone, with possibly more coal beneath the floor. This is of the Haddix bed, at altitude 1,300.

On the left, at the head of the branch, $\frac{3}{8}$ mile up it, Edward Richie has an eight-yard entry, under 10 feet of sandstone, with 60 inches of coal at its face. This is probably of the Hazard bed and is at altitude 1,410.

On the dividing ridge, $\frac{1}{4}$ mile to the left of a left branch with mouth at altitude 1,085, 4 miles up Clear creek and $\frac{3}{4}$ mile up the branch, a closed prospect, into a bed of coal supposed to be 4 feet thick, is at altitude 1,545. This is either of the Francis or Hindman bed.

On the left of a right branch, $4\frac{1}{4}$ miles up the creek, William Combs has an eight-yard entry into the Hazard bed at altitude 1,385, having 60 inches of coal at its face, beneath 9 inches of slate and shale and then 6 feet of sandstone. (S.)

On a right branch, $4\frac{1}{2}$ miles up the creek, $\frac{1}{4}$ mile up to its forks and on the left, $\frac{1}{8}$ mile up the left fork, Cleveland Combs has a ten-yard entry into the Hazard bed at altitude 1,395, having 59 inches of coal at the face, under 3 feet of shale and then sandstone. (S.)

On a right branch, $5\frac{1}{8}$ miles up the creek, on the left, $\frac{1}{4}$ mile up the branch, Jerry Combs has a three-yard entry with the following bed section:

Hazard Coal.

Sandstone	5 ft.
Shale.	
Coal	12"
Shale	1"
Coal	43"
Altitude, 1405. (S.)	

On a right branch, $5\frac{3}{8}$ miles up the creek, $\frac{1}{4}$ mile up the branch, and on the left of the left fork, William Combs has an eight-yard entry with the following bed section at its face:

Hazard Coal.

Sandstone	10 ft.
Coal	13"
Shale	3"
Coal	44"
Altitude, 1435. (S.)	

On the head of Clear creek, $5\frac{1}{2}$ miles up it, David Richie has a five-yard entry into the Hazard bed, at altitude 1,455, having one inch more coal than the preceding and 10 feet more sandstone exposed.

A bench mark in the gap at the head of the creek is at altitude 1,751.

The same bed with similar section is opened on the Lots creek side of the dividing ridge here.*

*In a former report on Lots Creek coals, those on Clear Fork and branches ascribed to the Flag bed are now determined to be of the Hazard bed, through knowledge of the increased interval in this vicinity between the Haddix and Hazard beds and of the series of openings of the latter on Clear Creek.

On a left branch with mouth at altitude 910, $31\frac{1}{4}$ miles up Troublesome creek, on the right, $\frac{1}{4}$ mile up the branch, a closed entry shows coal, under 3 feet of sandstone, at altitude 1,240. This is of the Hazard bed. (S.)

Above this entry Samuel Combs has another entry into the Flag bed at altitude 1,295 with over 4 feet of coal under 10 feet of shale. (S.)

On a left branch with mouth at altitude 915, 32 miles up the creek, on the left, $\frac{1}{8}$ mile up the branch, the Whitesburg bed (or Fire-clay coal) has 18 inches of coal, under 25 feet of sandstone, at altitude 965.

On the left at the head of this branch, $\frac{1}{4}$ mile up it, Samuel Combs has a closed entry into the Hazard bed, at altitude 1,315, having 54 inches of coal under sandstone.

On the left, by the road, 33 miles up the creek, a stain of the Fire-clay coal, under sandstone, is at altitude, 1,005.

A right branch, $33\frac{3}{4}$ miles up the creek, has at its mouth an altitude of 930.

In this branch, $\frac{7}{8}$ mile up it, is 2 inches of coal under 6 inches of limestone and upon 2 inches of slate. (S.) This is probably the Fire-clay coal rider.

A mile up this branch to a branch on the right, on the right of the latter, J. R. Combs has a closed entry, into the Hazard bed at altitude 1,380, having $11\frac{1}{2}$ feet of shale roof under sandstone and reported to have 55 inches of coal, including 2 inches of bone coal 2 inches from the top.

On the left, 34 miles up Troublesome creek, a seam of the Whitesburg bed shows beneath $1\frac{1}{2}$ feet of black slate and then 10 feet of sandstone, at altitude 950. Above this exposure a 7-inch stain of coal, probably of the Fire-clay coal rider, is at altitude 1,040. The distance by road from this stain to the coal at 33 inches up the creek is hardly $\frac{1}{4}$ mile.

On the left, $34\frac{1}{8}$ miles up the creek, R. L. Morgan has a two-yard entry, on a small bench, into the Hazard

coal at altitude 1,350 having 57 inches of coal under 40 feet of sandstone. There is an inch of bone coal a foot from the top.

The benches on this hill as given below indicate the approximate position of the several coal beds.

A bench at altitude 1350, Hazard coal.

A bench at altitude 1320, Common under Hazard coal.

A bench at altitude 1140, Hamlin coal.

A bench at altitude 1050, Fire-clay coal or rider.

Troublesome creek, 935.

On the left, $34\frac{1}{4}$ miles up the creek, one seam of the Whitesburg bed has 5 inches of coal with a 9-inch parting, beneath 7 inches of shale and then 10 feet of sandstone.

On a left branch, $34\frac{1}{2}$ miles up the creek, by the school house, an abandoned entry gives the following section:

Whitesburg Coal.

Sandstone.

Shale 2 ft.

Coal 4"

Shale 5"

Coal 2"

Shale 4"

Coal over 12"

Altitude, 960.

The lower seam of coal may be 2 feet thick or even a little more.

MONTGOMERY CREEK.

On the left, $34\frac{3}{4}$ miles up Troublesome creek: Altitude of mouth, 945.

On the right of Montgomery creek at its mouth is a thin coal under one foot of shale and between thick sandstones. It is a lower seam of the Whitesburg bed and is at altitude 955. This coal, apparently, appears again in the mouth of a left branch, altitude 975, $\frac{3}{4}$ mile up Montgomery creek.

On this left branch, on the right, $\frac{1}{8}$ mile up it, is an outcrop of a foot or more of coal beneath a foot of black slate and then 8 feet of sandstone. It is the upper seam of the Whitesburg bed and is at altitude 1,010.

Above the preceding outcrop is an unfinished prospect giving the following section:

Fire-clay Coal.

Shaie	1 ft.
Black slate	2"
Coal	1"
Shale	3"
Hard splint coal about	9"
Coal	8"
Altitude, 1060.	

The coal in Montgomery creek, $\frac{3}{4}$ mile up it, goes below drainage at the mouth of a branch $1\frac{1}{8}$ miles up, giving the following section just before going under:

Whitesburg Coal, Second Seam.

Shale	5 ft.
Coal	6"
Clay	3"
Coal	2"
Clay	4"
Coal	11"
Altitude, 990.	

On a right branch with mouth at altitude 1,025, two miles up Montgomery branch, in a right drain at the mouth of the right branch, E. H. Gearhart has a five-yard entry with the following bed section at its mouth:

Hamlin Coal.

Shale	6 ft.
Coal	17"
Black slate	4"
Hard splint coal	4"
Coal	6"
Altitude, 1170.	

The lower part of the shale covering is sandy and next to the coal a thin layer of it contains fossil shells.

The section is so like the preceding Fire-clay coal on Montgomery creek as to invite their correlation, but the lower coals as well as the benches lying nearly level along the stream, prove it otherwise.

On the left, 2 miles up Montgomery creek, the upper seam of the Whitesburg bed has 19 inches of coal under 3 feet of black slate and then 5 feet of sandstone. Its altitude is 1,040. The bench of the Fire-clay coal is about 50 feet higher.

On a left branch, $2\frac{3}{4}$ miles up Montgomery creek, on the right, $\frac{1}{8}$ mile up the left branch, a one-yard closed entry still shows a coal bed about 3 feet thick, including two partings and covered by 4 feet of shale. This covering seems to indicate the Fire-clay coal, but, at altitude 1,080, if the up-stream rise of strata continues, it must be of the Whitesburg bed.

In Montgomery branch, $3\frac{1}{4}$ miles up, the same bed was opened at altitude 1,105.

SHORT BRANCH.

On the right, $35\frac{1}{4}$ miles up Troublesome creek: Altitude of mouth, 950.

The following sections show on the right, $\frac{1}{8}$ to $\frac{1}{4}$ mile up the branch:

Whitesburg Coal.

Shaly sandstone.

Black slate 2 ft.

Coal about 12"

Clay 1 ft.

Shaly sandstone 3 ft.

Shale 15 ft.

Sandstone, thick.

Altitude, 1015.

Sandstone, thick.

Coal 4"

Shale 7"

Coal 6"

Shale 2"

Coal (?)

Altitude 965. (S.)

At the head of the branch, $\frac{7}{8}$ mile up it, D. L. Fuller has an eight-yard entry into the Hazard bed, under sandstone, with 46 inches of coal at its face (S.) Its altitude is 1,425.

On the left of the road and of Troublesome creek, $35\frac{3}{4}$ miles up it, J. S. Boggs has a ten-yard entry with the following section 2 yards in:

Whitesburg Coal, Second (?) Seam:

Sandstone.	
Coal	3"
Shale	6"
Coal	2"
Shale	3"
Coal	20"
Clay	1"
Coal	14"
Altitude, 975.	

On a left branch, $36\frac{1}{4}$ miles up the creek, on the right, $\frac{1}{8}$ mile up the branch, S. E. Boggs has a five-yard entry with the following section:

Whitesburg Coal, Second (?) Seam.

Shale	8 ft.
Coal	4"
Shale	7"
Coal	2"
Shale	5"
Coal	22"
Altitude, 975. (S.)	

At the head of a right drain, $36\frac{3}{4}$ miles up the creek, the Hazard bed has been opened, under sandstone with 56 inches of coal, at altitude 1,455. (S.)

WALKER BRANCH.

On the right, $37\frac{1}{4}$ miles up Troublesome creek: Altitude of mouth, 970.

On the left, $11\frac{1}{2}$ miles up the branch, is 16 inches of coal under 8 feet of shale and then sandstone. (S.) This, at altitude 1,105, is probably of the Fire-clay coal.

At the head of the right fork, 2 miles from the mouth of the branch, is a thick coal bed, possibly 7 feet, under sandstone, at altitude 1,555. This is either of the Francis or Hindman bed.

MILL CREEK.

On the right, $37\frac{3}{4}$ miles up Troublesome creek: Altitude of mouth, 975.

On the right, $\frac{5}{8}$ mile up Mill creek, is a prospect giving the following section:

Whitesburg Coal.

Black shale.	
Coal	1"
Clay	1"
Coal about	24"
Shale reported about	12"
Coal	6"
Altitude, 1055. (S.)	

On a right branch, $1\frac{3}{8}$ miles up Mill creek, with mouth at altitude 1,095, on the right, $\frac{1}{4}$ mile up the branch, Andrew Cornett has a five-yard closed entry with 27 inches of coal under $2\frac{1}{2}$ feet of shale and then 10 feet of sandstone. This, at altitude 1,320, is of the Haddix bed.

BUCK LICK BRANCH.

On the right, $1\frac{3}{4}$ miles up Mill creek: Altitude of mouth, 1,120.

On the right, $\frac{5}{8}$ mile up the branch, a ten-yard entry gives the following section:

Hazard Coal.

Sandstone.	
Coal	14"
Shale	3"
Coal	44"
Altitude, 1465. (S.)	

On the right, $1\frac{7}{8}$ miles up Mill creek, is 5 inches of coal under 1 foot of black, sandy shale and then thick

shale above. (S.) This, at altitude 1,140, is probably of the Fire-clay coal rider.

BIG BRANCH.

On the right, $39\frac{1}{2}$ miles up Troublesome creek: Altitude of mouth, 990.

On a right branch, $\frac{5}{8}$ mile up Big branch, on the left, $\frac{1}{4}$ mile up the right branch, a ten-yard entry, under 8 feet of sandstone, has at its face 19 inches of coal under 3 inches of slate, the latter 14 inches thick at the mouth of the entry. (S.) This, at altitude 1,130, is probably of the Fire-clay coal.

SWEET GUM BRANCH.

On the left, 1 mile up Big branch: Altitude of mouth, 1,020.

At this branch, $\frac{5}{8}$ mile up it, is exposed the following section:

Whitesburg Coal, Lower Seams.

Shaly sandstone	8 ft.
Coal and shale	3"
Shale	1 ft.
Sandstone	4 ft.
Shale	6 ft.
Coal	(?)
Altitude at base, 1049. (S.)	

On the right of a left branch, $\frac{3}{4}$ mile up Sweet-gum branch, at the mouth of the former, is the following exposure of a part of the same bed:

Sandstone.	
Shale	7 ft.
Coal	4"
Shale	4"
Coal	2"
Shale	3"
Coal	3"
Shale	3"
Coal about	12"
Altitude, 1050. (S.)	

Above the preceding, 1 mile up Sweet-gum branch, is the following exposure of part of the same bed:

Sandstone.	
Shale	8"
Coal	2"
Altitude, 1080. (S.)	

On the right, $1\frac{1}{2}$ miles up Sweet-gum branch, Jefferson Cornett has a prospect with the following section:

Fire-clay Coal.	
Shale	10 ft.
Coal	28"
Flint fire-clay	3 to 6"
Altitude, 1135. (S.)	

Either the upper seam of the Whitesburg bed or the marker under the Fire-clay coal shows in the branch at this point, about $1\frac{1}{2}$ feet of coal under sandstone at altitude 1,105.

On the right, $2\frac{1}{4}$ miles up the branch, Green Cornett has a ten-yard entry into what is probably the Francis bed, at altitude 1,570, having at the face 38 inches of coal under sandstone. (S.)

On the left, $1\frac{1}{4}$ miles up Big branch, M. Nichols has a prospect with the following section:

Whitesburg Coal, Lower Seam.

Sandstone.	
Shale	1"
Coal	4"
Shale	5"
Coal	2"
Shale	3"
Coal	2"
Altitude, 1040. (S.)	

A $2\frac{1}{2}$ foot seam (the upper one of the bed) is reported 30 feet higher. This is probably shown, $2\frac{1}{4}$ miles up Big branch, where more than a foot of coal is ex-

posed under 3 (?) feet of shale and then 20 feet of sandstone, its altitude being 1,100. (S.)

RIGHT FORK.

On the right, 3 miles up Big branch: Altitude of mouth, 1,195.

A quarter-mile up this fork is coal reported to have the following section:

Haddix Coal.

Shale.	
Coal	3 ft.
Shale	22"
Coal	(?)
Altitude, 1370.	

On the right, at the head of the fork, $\frac{1}{2}$ mile up it, N. W. Simpson has a three-yard entry into the Hazard coal (?), at altitude 1,495, having 45 inches of coal under sandstone roof.

On the left, $39\frac{3}{4}$ miles up Troublesome creek, Susan Cornett has a twenty-yard entry into the Fire-clay coal (or rider), at altitude 1,140, having about 33 inches of coal half way in. A sandstone with uneven bottom covers the bed for 15 feet up.

OGDEN BRANCH.

On the left, $40\frac{1}{2}$ miles up Troublesome creek: Altitude of mouth, 995.

BAKER BRANCH.

On the left, $\frac{1}{4}$ mile up Ogden branch: Altitude of mouth, 1,015.

Thin seams of the Whitesburg bed are exposed $\frac{3}{8}$ mile up this branch, at altitudes 1,055 and 1,080, the latter with a parting.

On the left, one mile up Ogden branch, is the following exposure, doubtless of the same seam as that just given on Baker branch:

Whitesburg Coal.

Massive sandstone	5 ft.
Coal	4"
Shale	6"
Coal	2"
Altitude, 1060.	

At Ogden branch, $1\frac{5}{8}$ miles up it, the Fire-clay coal, or a seam near it, shows at altitude 1,110.

In the road, $1\frac{7}{8}$ miles up the branch, a coal stain at altitude 1,215, is of the Hamlin bed.

The gap to Trace branch, at the head of Ogden branch, $2\frac{1}{8}$ miles up it, at altitude 1,430 is about on the level of the Flag bed. The ridge on either side of the gap, being 200 to 300 feet higher, gives a good area of this coal accessible from Troublesome creek or from Balls fork.

PUSHBACK BRANCH.

On the right, $41\frac{1}{4}$ miles up Troublesome creek: Altitude of mouth, 1,005.

On the left, $\frac{1}{4}$ mile up the branch, Bud Newland has a fifteen-yard entry with 27 inches of coal at the face. Over the coal is 6 inches of shale and then 10 feet of sandstone. This is of the Fire-clay coal at altitude 1,140. (S.)

On a right branch, $\frac{1}{4}$ mile up Pushback branch, on the right, $\frac{1}{4}$ mile up the right branch, the same coal is possibly $2\frac{1}{2}$ feet thick, under shaly sandstone and at altitude 1,140. (S.)

On a left drain, $\frac{3}{8}$ mile up this right branch, on the left, $\frac{1}{8}$ mile up the drain, is a ten-yard entry with the following bed section at the face of the exposure:

Fire-clay Coal.

Sandstone	5 ft.
Coal	26"
Clay shale	2 ft.
Sandstone	5 ft.
Covered	15 ft.
Sandstone	20 ft.
Altitude, 1140. (S.)	

On the left, $\frac{3}{8}$ mile up Pushback branch, Edward Richie has a five-yard entry into the Fire-clay coal, at altitude 1,140, having 25 inches of coal at its face and lying under 25 feet of sandstone.

On the left, $\frac{1}{2}$ mile up this branch, is the following section:

Whitesburg Coal.

Sandy shale	12 ft.
Coal	1"
Shale	6"
Coal	3"
Shale	6"
Coal	3"
Shale	7"
Coal (reported)	2 ft.
Altitude, 1075. (S.)	

On a left branch, $\frac{3}{4}$ mile up Pushback branch, on the left, $\frac{1}{4}$ mile up the left branch, Asa Dickenson has a five-yard entry, under 3 feet of sandstone, with 27 inches of coal at the face. It is of the Fire-clay coal at altitude 1,160. (S.)

On the left, $\frac{7}{8}$ mile up the branch, coal of the Whitesburg bed shows at altitude 1,110.

On the left, 1 mile up the branch, the Fire-clay coal, under sandstone, shows in a closed entry somewhat over 2 feet of coal at altitude 1,165. (S.)

On the right, $4\frac{1}{8}$ miles up Troublesome creek, Joseph Tignor has an eight-yard entry into the Fire-clay coal, under 10 feet of sandstone, 24 inches thick at the mouth of the entry. Its altitude is 1,155. (S.)

A quarter-mile up a right drain, $4\frac{1}{2}$ miles up the creek, a closed entry shows over 2 feet of coal under 10 feet of sandstone. This is of the Fire-clay coal at altitude 1,155. (S.)

On a left branch, $4\frac{1}{8}$ miles up the creek, on the right, $\frac{1}{4}$ mile up the branch, a five-yard wet entry has probably over 2 feet of coal. One to two feet of shale intervenes between it and the 5 feet of sandstone covering. It is of the Fire-clay coal at altitude 1,150. (S.)

On the right, $\frac{1}{4}$ mile up a right drain, 42 miles up the creek, is said to be over 2 feet of coal. This has 2 feet of shale between it and the covering sandstone and is of the Fire-clay coal at altitude 1,135. (S.)

CY EVERIDGE (EDWARDS) BRANCH.

On the right, $42\frac{1}{4}$ miles up the creek: Altitude of mouth, 1,010.

A quarter-mile up to a left branch and $\frac{1}{4}$ mile up it, on the right of its left fork, Sarah Everidge has a three-yard entry into the Fire-clay coal rider at altitude 1,170, having 24 inches of coal under 10 feet of sandstone. (S.)

On the left, $\frac{3}{4}$ mile up Everidge branch, is said to be 2 feet of coal. This is under shale, the lower 2 feet of it black, and is of the Fire-clay coal at altitude 1,145. Over this coal is another seam, 20 inches thick, under sandstone, of the Fire-clay coal rider. (S.)

The following thicknesses of coals are reported $\frac{1}{4}$ to $\frac{1}{8}$ mile up a right drain, $42\frac{1}{2}$ miles up the creek:

Hamlin Coal.

Sandstone.

Coal $1\frac{1}{2}$ ft.

Altitude, 1315.

Fire-clay Coal Rider.

Sandstone.

Shale 6 ft.

Coal 2 ft. and over

Altitude, 1180.

Fire-clay Coal.

Shale 10 ft.

Black shale 2 ft.

Coal with 2 partings.. 2 ft. and over

Altitude, 1160.

Whitesburg Coal.

Shale.

Coal with 3 partings 3 ft.

Altitude, 1100.

HINDMAN.

By measurement of stream on map, $42\frac{3}{4}$ miles up Troublesome creek: Altitude of court house step, 1,032.

The number of thin openings, just described into the Fire-clay coal and its rider indicate that no thick coal has been found convenient to the town, though small areas of the Hazard and Flag beds are possible near the tops of the hills. The Fire-clay coal is about 140 feet above the creek here, and the Amburgy coal, as found on Right fork, $27\frac{7}{8}$ miles above Hindman, is about 160 feet below that bed. The Amburgy bed should therefore be but little more than 20 feet below the creek, and the Elkhorn bed, 4 feet thick on Rockhouse creek, is probably about 200 feet below the Amburgy coal.

On the right, $\frac{1}{4}$ mile up the left branch back of the court house, is a quarry at altitude 1,060, of sandstone of exceptionally fine quality in 10 feet or more of its thickness. This stone is light gray in color, with medium size grains, without cleavage planes, and, while comparatively soft when freshly quarried, hardens on exposure. It is in use for town buildings, and other quarries in the same bed up the two forks of the creek furnish equally good building stone.

RIGHT FORK.

On the right of Troublesome creek at Hindman: Altitude of mouth, 1,015.

On the right, $\frac{1}{4}$ mile up the fork, Joseph Childress has a covered five-yard entry with the following approximate section:

Whitesburg Coal.

Sandstone.

Shale 8 ft.

Coal 6"

Shale 6"

Coal 3"

Shale 18"

Coal (?)

Altitude, 1110. (S.)

The Fire-clay coal on a former visit was seen in outcrop with black shale at altitude 1,150.

Still higher up an opening gave the following section:

Fire-clay Coal Rider.

Sandstone	10 ft.
Shaly sandstone	8"
Black shale	4"
Coal	24"
Altitude, 1175.	

A closed entry on the left, $\frac{3}{8}$ mile up the fork, at altitude 1,105, is of the Whitesburg bed.

BAKER BRANCH.

On the left, $\frac{3}{8}$ mile up Right fork: Altitude of mouth, 1,020.

Of four entries on the right, $\frac{1}{4}$ to $\frac{1}{2}$ mile up this branch, the following, belonging to H. C. Francis, a reminder of the same bed of coal on the heads of Clear creek and Mill branch, gave the greatest thickness of coal, measurement taken at the face of the first right room:

Hazard Coal.

Sandstone.	
Shale.	
Coal	13"
Shale	1"
Coal	34"
Altitude, 1490. (S.)	

The least measure in the entries was 41 inches of coal with 5 inches parting.

A sample taken on a former visit from the Jasper Baker entry just started under sandstone roof, including 42 inches of coal from the two seams and excluding a 5-inch parting, gave the following results on analysis by Dr. R. Peter:

Hazard Coal.

Laboratory No. 2755.

Moisture	1.44
Volatile combustible matter	41.67
Fixed carbon	52.24
Ash (reddish brown)	4.65
	100.00
Sulphur	1.05
Phosphorus	.009
Coke (spongy)	56.89
Total carbon	79.33
Specific gravity	1.264
B. T. U. per pound of coal.....	14,329

“Average sample of clean-looking coal.”

On the left of a right drain, $1\frac{1}{8}$ miles up the fork, is 23 inches of coal under sandstone. At altitude 1,195, it is probably of the Fire-clay coal rider.

PERKINS BRANCH.

On the right, $1\frac{1}{4}$ miles up Right fork: Altitude of mouth, 1,035.

On the right, $\frac{1}{8}$ mile up the branch, Henry Magyard has a five-yard wet entry with the following bed section at its mouth:

Whitesburg Coal.

Sandstone	8 ft.
Shale	2 ft.
Coal	6"
Shale	3"
Coal	3"
Shale	8"
Coal over	12"
Altitude, 1130.	

On a right branch, $\frac{1}{4}$ mile up Perkins branch, on the left, $\frac{1}{4}$ mile up the right branch, Daniel Hays has an eight-yard entry, under 5 feet of sandstone, with 21 inches of coal at its face. (S.) This, at altitude 1,195, is of the Fire-clay coal.

In a left drain, $\frac{5}{8}$ mile up Perkins branch, is 12 inches of coal, under black slate, the upper seam of the Whitesburg bed.

On a left branch, $\frac{1}{2}$ mile up Perkins branch, on the left, $\frac{1}{8}$ mile up the left branch and on its right fork, Jack Sturgill has a ten-yard entry with the following section at its mouth:

Fire-clay Coal Rider.

Sandstone	5 ft.
Coal	26"
Shale	6"
Coal	11"
Bituminous shale.	
Altitude, 1235. (S.)	

On the left, $\frac{3}{4}$ mile up Perkins branch, Albert Madden has a ten-yard entry with the following section at its mouth:

Fire-clay Coal Rider.

Sandstone.	
Coal	22"
Clay, knife-edge.	
Coal	1"
Shale	4"
Coal	4"
Bituminous shale.	
Altitude, 1225. (S.)	

On the left, $1\frac{1}{2}$ miles up the branch, is 10 inches of coal, the upper seam of the Whitesburg bed, under 2 feet of black slate and then 3 feet of shaly sandstone. Its altitude is 1,150.

On the right of a right branch, $1\frac{1}{2}$ miles up Perkins branch, $\frac{1}{8}$ mile up the right branch, Benjamin Everidge has an eight-yard entry with the following bed section 3 yards in:

Fire-clay Coal.

Sandstone	5 ft.
Coal	26"
Clay	1"
Coal	5"
Flint fire-clay	5"
Coal	7"
Fire-clay.	
Altitude, 1190.	

In Perkins branch, $1\frac{5}{8}$ miles up it, appears finally, the Whitesburg coal under black slate, at altitude 1,170.

On the right, $1\frac{5}{8}$ miles up Perkins branch, a twelve-yard entry into the Fire-clay coal is at altitude 1,185.

While the Fire-clay coal bed shows a slight dip up stream, contrary to expectation the strata as seen along the branch, appear decidedly to rise. This may be a result of a lessening interval, going up the branch, between the several seams of the Whitesburg bed and between the latter and the Fire-clay coal.

CAVE BRANCH.

On the right, $1\frac{3}{4}$ miles up Right fork: Altitude of mouth, 1,040.

On the left, $\frac{1}{2}$ mile up the branch, John Fugate has a fifteen-yard entry of the following section, the good 34 inches of coal measured 5 yards in:

Fire-clay Coal.

Shaly sandstone	3 ft.
Shale	6 ft.
Iron ore	$\frac{1}{2}$ "
Shale	2 ft.
Coal	27"
Clay	1"
Coal	7"
Bone coal about	3"
Hard clay about	3"
Soft clay.	
Altitude, 1215.	

The hard clay at the bottom of the section probably represents the flint fire-clay.

From a pit in the branch, $\frac{7}{8}$ miles up it, coal of the Whitesburg bed at altitude 1,120, has been taken.

On the left, $1\frac{1}{2}$ miles up the branch, Joseph Parley has a ten-yard entry with the following section at its mouth:

Fire-clay Coal Rider.

Shale.	
Coal	1"
Clay	1"
Coal	32"
Black slate	7"
Shale	5"
Coal	2"
Altitude, 1205.	

Nearly under the preceding he has an entry with the following section at its mouth:

Fire-clay Coal.

Sandstone	6 ft.
Coal	26"
Clay	2"
Bone coal	4"
Flint fire-clay	6"
Coal	7"
Altitude, 1185.	

On the left, $1\frac{1}{4}$ miles up the branch he has another entry, 8 yards into the Fire-clay coal, at altitude 1,185, under 5 feet of shale and with no variation in section more than an inch.

To the right fork, $1\frac{3}{4}$ miles up Cave branch and thence on the right, $\frac{1}{4}$ mile up that fork, to David Colton's closed prospect at altitude 1,765, said to have 7 feet of coal, under shale. This is of the Hindman bed, and is in the same peak, probably is the same opening as formerly measured and found approximately 116 inches thick without evident parting, the land said to belong to Freeman Parks.

PARKS BRANCH.

On the left, $1\frac{7}{8}$ miles up Right fork: Altitude of mouth, 1,045.

In a right drain, $\frac{3}{8}$ mile up the branch, Wiley Parks has a four-yard entry into what is probably the Fire-clay coal, having 32 inches of coal at its face, under 3 feet of shale and at altitude 1,225.

On the right, $\frac{3}{4}$ mile up the branch, a prospect gives the following:

Whitesburg Coal.

Sandstone	15 ft.
Coal	7"
Shale	7"
Coal	2"
Shale	12"
Coal	6"
Shale	8"
Coal	(?)
Altitude, 1150. (S.)	

On a right branch, 2 miles up Right fork, on the left, $\frac{1}{4}$ mile up the branch, Wesley Hays has a twenty-yard entry with the following section at its mouth:

Fire-clay Coal.

Laminated sandstone	1 ft.
Shale	6"
Iron ore	$\frac{1}{2}$ "
Shale	12"
Coal	28"
Clay	1"
Coal	11"
Hard clay about	3"
Clay.	
Altitude, 1225.	

The $\frac{1}{2}$ inch iron ore alone suffices to correlate this opening with the Fugate opening on Cave branch.

On a left branch, $2\frac{3}{8}$ miles up Right fork, on the right, $\frac{1}{4}$ mile up the branch, Joseph Pigman has a five-yard entry with the following section at its face:

Fire-clay Coal.

Shaly sandstone	2 ft.
Shale.	
Coal	5"
Shale	4"
Coal	32"
Shale over	3"
Altitude, 1215.	

Flint fire-clay is questionably reported under this coal.

TRACE FORK.

On the right, $2\frac{1}{2}$ miles up Right fork: Altitude of mouth, 1,060.

On a left drain, $\frac{1}{4}$ mile up Trace fork, on the right, $\frac{1}{8}$ mile up the drain, Grant Smith has a ten-yard entry with the following section at its mouth:

Fire-clay Coal.

Sandstone.	
Shale	4"
Coal	31"
Shale	4"
Coal	3"
Bone coal and black slate	9"
Altitude, 1240. (S.)	

On the left, $\frac{3}{8}$ mile up Trace fork, A. J. Smith has a two-yard entry with the following section at its face:

Fire-clay Coal.

Sandstone.	
Shale	4"
Sandstone	3"
Shale	6"
Coal	31"
Altitude, 1235. (S.)	

On a right branch, $\frac{7}{8}$ mile up Trace fork, $\frac{1}{8}$ mile up the branch, 3 inches of coal with 1 inch parting, of a part of the Whitesburg bed, under 6 feet of shale is at altitude 1,140.

On the right, $\frac{1}{4}$ mile up this branch, Shade Stacy has a ten-yard wet entry with the following section at its mouth:

Fire-clay Coal.

Sandstone.	
Shale	2 ft.
Coal	28"
Shale	3"
Coal, black slate and bone coal about	12"
Altitude, 1215. (S.)	

On a left branch, $1\frac{1}{8}$ miles up Trace fork, on the left, $\frac{3}{8}$ mile up the branch, William Mullins has an eight-yard entry with the following bed section at its face:

Fire-clay Coal.

Sandstone.	
Shale	2½ ft.
Coal	31"
Shale	½"
Altitude, 1240. (S.)	

Bone coal and slate are reported under the coal. About a foot of the coal near the bottom is splint coal. Sulphur bands are present.

RIGHT FORK.—On the right, $1\frac{1}{2}$ miles up Trace fork: Altitude of mouth, 1,175.

On the left, $\frac{1}{8}$ mile up this fork, Randolph Adams has a ten-yard entry with the following section at its mouth:

Fire-clay Coal.

Shaly sandstone	4 ft.
Coal	29"
Flint fire-clay	4"
Coal	7"
Altitude, 1225. (S.)	

Thin coal, under sandstone, in the road up this fork to Irishman creek, at altitude 1,355, is of the Hamlin bed.

A flagstone quarry, beside the same road, in 30 feet of sandstone with 2 feet of limestone 10 feet from the bottom, is at altitude 1,455. The Haddix bed lies close above this sandstone, which is almost invariably massive, and the Hazard bed is about at the level of the gap to Irishman creek: Altitude, 1,550.

LEFT FORK.—On the left, $1\frac{1}{2}$ miles up Trace fork: Altitude of mouth, 1,175.

In a left drain, $\frac{1}{4}$ mile up this fork, is the following exposure:

Hamlin Coal.

Shale.	
Coal	17"
Bone coal and black	
slate	6"
Shale	10 ft.
Coal	3"
Shale	3"
Coal	10"
Altitude, 1350. (S.)	

On a right branch, $\frac{3}{8}$ mile up this left fork, on the left at its mouth, an exposure of coal, under shale, at altitude 1,285, is probably of the Fire-clay coal rider.

On the right, $\frac{3}{8}$ mile up this right branch, a fifteen-yard entry under shaly sandstone has 58 inches of coal one-half way in it, and is at altitude 1,650. (S.) A former measure of probably the same entry at its mouth, gave 56 inches of coal and 5 inches of black slate 8 inches from the bottom. It is of the Flag bed.

On a right branch, $2\frac{3}{4}$ miles up Right fork of Troublesome, on the right, $\frac{1}{2}$ mile up the branch, a three-yard entry has the following section at its mouth:

Fire-clay Coal.

Shale	4 ft.
Coal	6"
Shale	3 ft.
Coal	1"
Shale	27"
Coal	32"
Altitude, 1225.	

On the left, beside the road, $2\frac{7}{8}$ miles up Right fork, Mr. Napier has a ten-yard entry with the following section at its mouth, the lower 6 inches of coal in water:

Amburgy Coal.

Shaly sandstone	20 ft.
Coal	35"
Altitude, 1065.	

This bed, below drainage at Hindman, remains above the Right fork up to about the mouth of Sams branch,

4 miles above Hindman, but no other sign of its exposure is known to have been found along this outcrop.

SAW-PIT BRANCH.

On the left, 3 miles up Right fork: Altitude of mouth, 1,065.

On the left, $\frac{1}{4}$ mile up the branch, E. H. Hammond has a twenty-yard entry with the following bed section, half way in it:

Fire-clay Coal.

Sandstone	5 ft.
Shale	3"
Coal	38"
Fire-clay	1½ ft.
Altitude, 1230. (S.)	

Flint fire-clay is questionably reported below the common fire-clay floor of this entry.

A half mile to the forks of this branch and on the right, $\frac{1}{4}$ mile up the right fork, a closed entry, under 5 feet of sandstone, shows the Fire-clay coal, probably, to be 3 to 4 feet thick. Its altitude is 1,270. (S.)

CALHOUN BRANCH.

On the left, $3\frac{1}{8}$ miles up Right fork: Altitude of mouth, 1,070.

On the left, $\frac{1}{4}$ mile up the branch, J. Jones has a closed entry into the Fire-clay coal at altitude 1,255.

On the left of a right drain, $3\frac{1}{4}$ miles up Right fork, the Fire-clay coal is 28 inches thick, under $2\frac{1}{2}$ feet of shale and then shaly sandstone, and is at altitude 1,245. (S.)

CY BRANCH.

On the left, $3\frac{3}{4}$ miles up Right fork: Altitude of mouth, 1,090.

On the left, $\frac{1}{2}$ mile up the branch, a closed entry gives the altitude of the Fire-clay coal at 1,270. On the opposite hillside the Hamlin coal is at altitude 1,370.

SAMS BRANCH.

On the right, 4 miles up Right fork: Altitude of mouth, 1,100.

On a right branch, $\frac{1}{4}$ mile up Sams branch, on the right, $\frac{1}{4}$ mile up the right branch, J. M. Pigman has a ten-yard entry with the following section at its mouth:

Fire-clay Coal.

Shale	5 ft.
Sandstone	$\frac{1}{2}$ ft.
Shale	$1\frac{1}{2}$ ft.
Coal	2 ft.
Altitude, 1250. (S.)	

To the forks of the branch, $\frac{3}{8}$ miles, and on the left, $\frac{1}{4}$ mile up the right fork, E. Short has an entry showing something over 2 feet of coal, under $1\frac{1}{2}$ feet of shale and then sandstone. This is of the Fire-clay coal at altitude 1,240.

On a right branch, $4\frac{1}{4}$ miles up Right fork of Troublesome, on the right, $\frac{1}{4}$ mile up the branch, N. Craft has a fifteen-yard entry with the following section at its mouth:

Fire-clay Coal Rider.

Sandstone	5 ft.
Shale	5 ft.
Coal	1"
Shale	2"
Coal	31"
Altitude, 1295. (S.)	

REYNOLDS (RUNNELLS) FORK.

On the left, $4\frac{5}{8}$ miles up Right fork: Altitude of mouth, 1,125.

On a left branch, $\frac{1}{4}$ mile up this fork, on the right, $\frac{1}{8}$ mile up the branch, William Hodge has a closed entry into the Fire-clay coal bed under shale roof, at altitude 1,250, said to have over 2 feet of coal.

One hundred yards farther up the branch the following section is exposed:

Fire-clay Coal Rider.

Shaly sandstone.

Shale 1 ft.

Cannel coal 1"

Coal 29"

Altitude, 1290. (S.)

On the left, $\frac{3}{8}$ mile up the branch, a ten-yard wet entry gives the following at its mouth:

Fire-clay Coal Rider.

Sandstone 5 ft.

Shale 1 ft.

Coal 1"

Shale 3"

Coal over 24"

Altitude, 1315. (S.)

On a left branch, $\frac{1}{2}$ mile up Reynolds fork, on the right, $\frac{1}{4}$ mile up the branch, W. Reynolds has a twenty-five-yard entry with the following bed section 5 yards in:

Fire-clay Coal Rider.

Sandstone 3 ft.

Shale 3"

Black slate and thin

cannel coal 1"

Coal 25"

Altitude, 1300. (S.)

On a left branch, $\frac{5}{8}$ mile up Reynolds fork, on the left, $\frac{1}{8}$ mile up the branch, W. T. Campbell has a twenty-yard entry with the following section 5 yards in:

Fire-clay Coal Rider.

Sandstone.

Black shale 4"

Cannel coal $\frac{1}{4}$ "

Coal 26"

Altitude, 1290. (S.)

On a right branch, $\frac{3}{4}$ mile up Reynolds fork, M. Reynolds has 27 inches of coal in the Fire-clay coal rider, under 4 feet of shale, at altitude 1,305. (S.)

From the forks at Mallie postoffice, on the left, $\frac{3}{8}$ mile up the left fork, W. Reynolds has 30 inches of coal in the Fire-clay coal rider, under 7 feet of shale roof, at the mouth of a twenty-yard entry at altitude 1,305.

LEFT FORK.

On the left at Hindman: Altitude of mouth, 1,015.

A sandstone quarry on the right, $\frac{1}{8}$ mile up this fork, is at altitude 1,055.

At its forks, $\frac{1}{4}$ mile up a left branch, $\frac{1}{2}$ mile up Left fork, a thin coal, under shale and then the quarry sandstone, is at altitude, 1,055.

On the right fork of this branch, $\frac{1}{8}$ mile up it, J. W. Short has a prospect with the following section:

Fire-clay Coal.

Sandstone	20 ft.
Coal	21"
Shale	2"
Coal	2"
Altitude, 1145. (S.)	

OWENS BRANCH.

On the left, $\frac{7}{8}$ mile up Left fork: Altitude of mouth, 1,020.

A quarry on the right at the mouth of this branch is at altitude 1,050. Another quarry on the right, $\frac{1}{2}$ mile up the branch, is at altitude 1,070. Under the latter is 2 to 3 feet of shale and then a thin coal.

On a right branch, $\frac{7}{8}$ mile up Owens branch, on the left, $\frac{1}{8}$ mile up the branch, an upper seam of the Whitesburg bed is exposed under 15 feet of sandstone with 14 inches of coal and a parting of 2 to 4 inches, at altitude 1,095.

On the left, $1\frac{1}{2}$ miles up Owens branch, $\frac{1}{4}$ mile to the left of the gap to Stewart fork, an old unfinished prospect into the Francis bed shows it 6 feet or more thick with 4 feet of coal in sight. Its altitude obtained (probably too low) is 1,575.

Coal of the Flag bed, found on a broad bench between the preceding prospect and the gap, is at altitude

1,515. The gap, at altitude 1,455, is about at the level of the Hazard bed.

On a right branch, $1\frac{5}{8}$ miles up Left fork, on the left, $\frac{1}{4}$ mile up the branch, R. L. Sloane has a twelve-yard entry with the following section 12 yards in:

Hazard Coal.

Shale.	
Coal	8"
Shale	2"
Coal	32"
Altitude, 1490. (S.)	

POSSUM-TROT BRANCH.

On the left, $2\frac{1}{4}$ miles up Left fork: Altitude of mouth, 1,040.

On a right drain, $\frac{1}{4}$ mile up this branch, on the left, $\frac{1}{8}$ mile up the drain, W. H. Pratt has a twenty-yard entry with the following section 15 yards in:

Hazard Coal.

Shale.	
Coal	8"
Shale	7"
Coal	33"
Altitude, 1490. (S.)	

MILL CREEK.

On the right, $2\frac{1}{2}$ miles up Left fork: Altitude of mouth, 1,045.

On a right branch, $\frac{3}{4}$ mile up this creek, on the right, $\frac{1}{2}$ mile up the branch, I. Thacker has a twenty-yard entry with the following section 15 yards in:

Hazard Coal.

Shale.	
Coal	6"
Shale	5"
Coal	34"
Altitude, 1490. (S.)	

On the left, $1\frac{1}{2}$ miles up the creek, is the following exposure:

Whitesburg Coal.

Sandstone	10 ft.
Shale	7"
Coal	5"
Shale	4"
Coal	6"
Altitude, 1155. (S.)	

On a left branch, $2\frac{1}{4}$ miles up the creek, on the left, $\frac{1}{8}$ mile up the branch, R. B. Tate has a five-yard entry with the following bed section at its face:

Fire-clay Coal Rider.

Sandstone.	
Shale	10"
Coal	3"
Shale (with coal)	9"
Coal	22"
Altitude, 1265. (S.)	

On the left, $2\frac{3}{8}$ miles up the creek, William Cox has a closed entry into the same bed at altitude 1,255, showing the shale covering increased to 5 feet thickness, the upper coal seam to 4 inches, the parting to about 18 inches. (S.)

On the left, $2\frac{1}{2}$ miles up the creek, a prospect gives the following section:

Hazard Coal.

Sandstone	6 ft.
Shale	$1\frac{1}{2}$ ft.
Coal about	6"
Shale	15"
Coal	28"
Shale	9"
Coal over	6"
Altitude, 1560.	

Opposite the mouth of Mill creek, beside the road, is an unfinished prospect into a lower seam of the Whitesburg bed at altitude 1,080. This coal lies close

under the quarry sandstone, is pinched out completely $\frac{1}{8}$ mile down Left fork and, although showing a considerable stain at the prospect, is but 5 inches thick as exposed at the quarry, $\frac{1}{4}$ mile farther up the creek.

On the right, $3\frac{1}{4}$ miles up Left fork, the same seam at altitude 1,080, is 18 inches thick, including a 6-inch parting in the middle.

JONES FORK.

On the left, 4 miles up Left fork: Altitude of mouth, 1,080.

On the right, $\frac{1}{4}$ mile up this fork, a higher seam of the Whitesburg bed than that under the quarry sandstone has the following section:

Whitesburg Coal, Upper (?) Seam.

Sandstone.

Coal 5"

Black slate 1"

Coal 6"

Shale 1"

Coal 2"

Altitude, 1100.

On the right, $\frac{7}{8}$ mile up the fork, George Tuft has two entries, one of them at its face, 20 yards in, giving the following bed section:

Fire-clay Coal.

Sandstone 15 ft.

Black slate 4"

Coal 41"

Altitude, 1150. (S.)

Being but 10 feet above the fork a large area of this fine-looking coal is available here.

NEALY BRANCH.

On the left, $4\frac{3}{8}$ miles up Left fork: Altitude of mouth, 1,090.

On the left, $\frac{1}{4}$ mile up the branch, is 10 inches of coal under sandstone at altitude 1,105, of the Whitesburg coal bed.

On the right of a left branch, $\frac{1}{2}$ mile up Nealy branch, $\frac{1}{8}$ mile up the left branch, a two-yard entry gives the following bed section at its face:

Whitesburg Upper Coal Seam.

Sandstone (Rock-house)	10 ft.
Black slate	6"
Coal	10"
Shale	14"
Coal	5"
Clay about	12"
Sandstone.	
Altitude, 1130.	

On the left, $\frac{1}{4}$ mile up this left branch, a one-yard entry has the following section:

Fire-clay Coal.

Sandstone	10 ft.
Coal	24"
Altitude, 1185.	

On the right, $\frac{5}{8}$ mile up Nealy branch, the face of a two-yard entry has the following bed section:

Whitesburg Upper Coal Seam.

Sandstone.	
Black slate about	30"
Coal about	12"
Shale about	12"
Coal	10"
Altitude, 1150. (S.)	

On the right, $\frac{3}{4}$ mile up Nealy branch, a one-yard entry has the following bed section:

Whitesburg Upper Coal Seam.

Sandstone (Rock-house)	8 ft.
Black slate	2 ft.
Coal	11"
Shale	6"
Coal	7"
Altitude, 1150.	

On the right, $1\frac{1}{8}$ miles up Nealy branch, the Fire-clay coal, under 5 feet of sandstone, is opened in an entry, at altitude 1,210, having 33 inches or more coal, the lower 6 inches in water and not seen. The bottom 3 inches of coal is said to be left as a floor because hard and poor. Under it is a hard fire-clay (not flint) about 3 inches thick, with soft shale beneath.

ALUM CAVE BRANCH.

On the left, $4\frac{3}{4}$ miles up Left fork: Altitude of mouth, 1,115.

On the left, $\frac{1}{8}$ mile up this branch, is 12 inches of coal with one inch parting of the Whitesburg bed, under 7 feet of sandstone, at altitude 1,125.

On the left, $\frac{1}{2}$ mile up the branch, is a foot of coal, the upper seam of the same bed, under $1\frac{1}{2}$ feet of black slate and then 10 feet of sandstone, at altitude 1,155.

On the left, $\frac{5}{8}$ mile up the branch, is the following section:

Fire-clay Coal.

Sandstone	5 ft.
Coal	35"
Shale	1"
Black slate.	
Altitude, 1205. (S.)	

On a right branch, 5 miles up Left fork, on the left, $\frac{1}{4}$ mile up the branch, G. C. Childress has a twenty-yard entry with the following section 12 yards in:

Fire-clay Coal.

Sandstone.	
Coal	5"
Sandy shale	1"
Coal	27"
Altitude, 1225. (S.)	

In the branch at this point is a foot of coal (with shale and more coal reported below it) of the Whitesburg bed under black slate, at altitude 1,175.

On the left, $5\frac{3}{8}$ miles up Left fork, is the following section:

Whitesburg Coal.

Sandstone	20 ft.
Coal	3"
Sandstone	2"
Black slate	1"
Coal	6"
Altitude, 1165. (S.)	

On a left branch, $5\frac{5}{8}$ miles up the fork, on the left, $\frac{1}{4}$ mile up the branch (on its right fork) Silas Watts has a fifteen-yard entry with the following section 5 yards in:

Fire-clay Coal.

Sandstone	4 ft.
Black slate	1"
Shale	3"
Coal	33"
Altitude, 1260. (S.)	

On the left, 6 miles up Left fork, Squire Watts has a five-yard entry with the following bed section at its face:

Fire-clay Coal.

Sandstone	6 ft.
Shale	3"
Black slate	3"
Splint coal	4"
Shale	5"
Coal, thin.	
Sandstone about	6"
Coal	22"
Altitude, 1290. (S.)	

**COALS OF FIRST CREEK,
PERRY COUNTY.**

COALS OF FIRST CREEK.

First creek, about 6 miles long, flows from the north into the Kentucky river at Typo, $5\frac{1}{2}$ miles by rail below Hazard.

The strata in outcrop along the creek range from the Whitesburg coal bed at about stream level at the mouth of the creek, to some 200 feet above the Hindman bed in the high hills toward the head. The principal coal beds and approximate intervals between them are as follows, the names applied to the beds and the local numbering both being given:

Hindman Coal.
Interval 50 (?) feet.
Francis Coal, No. 8.
Interval 100 (?) feet.
Flag Coal, No. 7.
Interval 50 feet.
Hazard Coal, No. 6.
Interval 80 feet.
Haddix Coal, No. 5.
Interval 200 (?) feet.
Fire-clay Coal, No. 4.
Interval 50 (?) feet.
Whitesburg Coal.

The Whitesburg coal was not seen in the investigation made recently by the writer, but it is reasonable to assume that it is split into several seams of no value, as shown in outcrop slightly above river level on Willard and Big creeks and on Messer branch at Hazard.

The Fire-clay coal has not been certainly identified on First creek, but if found, even in good thickness, considerable development would be necessary to establish its value, owing to the extreme variability of the bed along the river and its affluents below First creek. First creek seems to be about on the border line between the irregularity of the bed down the river and its uniformly good section in the Hazard mining region.

The Haddix coal is open in one place only, so far as known, and there shows a thickness of over 4 feet

of coal, but with a parting of 15 inches. The excellent roof and floor here and the usually high grade of coal of this bed should lead to its thorough exploitation, but the higher Hazard bed is now more attractive.

The Hazard coal, with unimportant exceptions, varies in thickness of coal from 4 feet to 6 feet, usually without parting, though containing a little rather persistent bone coal. The thickest coal is near the mouth of the creek, where its area is small, but developments toward the head furnish proof of a wide field of great value. Four companies have acquired leases and are actively engaged in preparations for a large production of coal, a spur track of the Lexington and Eastern Railway being in incipient operation to the upper plant.

Samples of this coal collected by the writer and analyzed at the Kentucky Agricultural Experiment Station gave the following results:

Analyses of Air-dried Samples.

Laboratory Numbers	G. 3704	G. 3705
Moisture	2.28	2.42
Volatile combustible matter....	38.03	36.31
Fixed carbon	52.43	52.63
Ash, gray	7.26	8.64
	100.00	100.00
Sulphur	.67	.65
B. T. U. per pound.....	13369.	13129.
Specific gravity	1.298	1.354

Number G. 3,704 was taken from the head of an entry, 150 yards in, of the Harvey Coal Co.; number G. 3,705 from the head of an entry, 20 yards in, of the Kentucky Block Coal Co. The slightly poorer analysis of the latter is accounted for by the effect of weathering of the coal near the surface of the ground, visible also in the sample, which was "rather dull looking," while the former was "bright clean looking coal," according to the remarks of the analyst. In general the quality appears to be nearly uniform along the creek and with little variation in its bed section.

The Flag coal appears to be 4 feet thick at the head of the creek, where alone in this locality it was found,

but openings on Lost creek branches indicate a continuance of thick coal in this bed. The mining of the Hazard bed preceding that of the Flag is likely to result in the loss of much of the latter bed.

No coal of higher beds than the Flag was found on First creek, but intervals to higher beds liable to prove of workable thickness and with sufficient area are given on the first page of this report.

Following are details of openings visited and exposures seen. Altitudes given are as determined by barometer. Distances up the creek are taken from the United States Geological Survey map.

On the left, $\frac{1}{4}$ mile up First creek, Leland Standiford has a twenty-yard entry with the following bed section at its face, the lower 6 feet only being mined.

Hazard Coal.

Earth.	
Coal about	18"
Shale	7"
Coal	72"
Altitude, 1160.	

This is 355 feet above the mouth of the creek and there appears to be less than 100 feet of covering over the coal here and on the opposite side of the creek.

BEE BRANCH.

On the left, $1\frac{3}{4}$ miles up First creek: Altitude of mouth, 905.

At its head, $\frac{1}{2}$ mile up this branch, E. C. Combs has an eight-yard entry with the following section:

Hazard Coal.

Sandstone	3 ft.
Shale	20"
Coal	2"
Shale	1"
Coal	69"
Altitude, 1170.	

A broad bench here, at altitude 1,090, marks the approximate place of the Haddix coal.

Three inches of coal at altitude 915 in the railroad cut, $1\frac{7}{8}$ miles up the creek, is probably of the Fire-clay coal not fully developed. Coal which appears to be of the same bed has been taken from the creek, 2 miles up it. This is reported thin, but it is likely that if a parting is present in the bed the coal below it was not found.

On a left branch, 2 miles up the creek, on the left $\frac{1}{4}$ mile up the branch, Ira Stacy has a fifteen-yard entry into the Hazard bed, at altitude 1,180, having 64 inches of coal without parting, under 5 feet of massive sandstone. A moderate-sized working area is available here.

PETER BRANCH.

On the right, $2\frac{1}{2}$ miles up the creek: Altitude of mouth, 955.

On the left, $\frac{1}{4}$ mile up this branch, a fifteen-yard entry with about 5 feet of coal at its face, gives the following section:

Hazard Coal.

Sandstone	5 ft.
Coal	8"
Shale	39"
Coal about	60"
Altitude, 1200.	

WOLF-PEN BRANCH.

On the left, 3 miles up First creek: Altitude of mouth, 970.

The Kentucky Block Coal Company has opened several entries on the left of this branch in which the coal varies in thickness from 59 inches, 20 yards in No. 1, to 65 inches, 5 yards in No. 3, from $\frac{1}{8}$ mile to $\frac{1}{4}$ mile up the branch. Analysis (No. G. 3705) of a sample from the face of No. 1 entry, is given on a preceding page. The bed section follows:

Hazard Coal.

Sandstone.	
Coal	50"
Bone coal	1"
Coal	8"
Clay	12"
Altitude, 1200.	

On the left, $3\frac{3}{8}$ miles up First creek, the face of a twenty-yard entry into the Hazard bed, under sandstone, gives 66 inches of coal at altitude 1,170.

At the head of a left hollow, $3\frac{1}{2}$ miles up the creek, the same bed, under sandstone, gives 76 inches of coal at altitude 1,165. On the right of the same hollow, in a two-yard entry the coal is about 6 feet thick, but still soft from outcrop exposure.

WHITE OAK BRANCH.

On the left, $3\frac{5}{8}$ miles up First creek: Altitude of mouth, 1,000.

The coal on this branch and on considerable adjoining land has been leased by the Blue Diamond Coal Company and seems to have been well prospected with diamond drill and otherwise, but the results obtained were not accessible, except as found in openings visited.

On the left of the branch, $\frac{1}{8}$ and $\frac{1}{4}$ mile up it, at the face and mouth of six-yard entries, under sandstone, the Hazard coal is 70 and 72 inches thick, respectively, and at altitude 1,210.

On a right hollow, $\frac{1}{4}$ mile up the branch, a prospect on the right and a 3-yard entry on the left give, respectively, 70 and 66 inches of coal in the Hazard bed at altitudes 1,235 and 1,225.

On the left of a left drain, $\frac{3}{8}$ mile up the branch a sixty-yard prospecting entry into the Hazard bed at altitude 1,205 penetrated an irregularity in the coal probably to its farthest extent. The thickness of coal varies along the entry from 2 feet to $5\frac{1}{2}$ feet, roof and floor both rising or falling as the thickness of the coal changes, while maintaining nearly the right general level of the bed. The disturbance is, doubtless, confined to a small area. An entry on the right of the same drain,

abandoned on reaching the coal, is so covered as to give no indication of its thickness.

On the right, $\frac{3}{8}$ mile up the branch, a prospect discloses the following:

Haddix Coal.

Shale.	
Coal	12"
Shale	12"
Sandstone	3"
Shale	12"
Black slate	10"
Coal	2"
Black slate	7"
Coal	29"
Shale	15"
Coal	27"
Bituminous sand-	
stone	2"
Shaly sandstone	10 ft.
Altitude, 1125.	

If such section of thick coal, excellent black slate roof and substantial floor maintains over a considerable area, an important addition to the coal of this vicinity is assured, notwithstanding the thick parting. The coal of this bed is usually particularly handsome in appearance and when generally known will be in great demand.

On the left, $\frac{1}{2}$ mile up the branch, at 4 yards in a wet entry, the Hazard bed, under sandstone, has 63 inches of coal.

On the left of a right hollow, $\frac{5}{8}$ mile up the branch, a six-yard entry into the same bed has 42 inches of coal at its face (41 inches at its mouth) and is at altitude 1,205.

On the right of a left drain, $\frac{7}{8}$ mile up the branch, $\frac{1}{8}$ mile up the drain, the face of a four-yard entry into the Hazard bed shows about 5 feet of coal, under sandstone, at altitude 1,205.

ROAD BRANCH.

On the right, $3\frac{7}{8}$ mile up First creek: Altitude of mouth, 1,025.

On the right, $\frac{1}{8}$ mile up this branch, the First Creek Coal Company has a prospect into the Hazard bed with 76 inches of coal under 2 feet of shale and at altitude 1,220. Though this appeared to be the only opening on the lease, construction work was advancing rapidly.

On the left, 4 miles up First creek, a prospect into the Hazard bed shows 60 inches of coal under sandstone at altitude 1,225.

On a right branch with mouth at altitude 1,155, 4 miles up the creek, on the right at its mouth, a two-yard entry gives the following:

Hazard Coal.

Shale.	
Coal	8"
Shale	21"
Coal	51"
Altitude, 1235.	

On the left, at track level, 5 miles up the creek, under 20 feet of massive sandstone, is 22 inches of coal at altitude 1,190. This is of the Hamlin bed, a coal of little consequence except as a marker to the position of the coals above and below it.

On the right, $5\frac{1}{2}$ miles up the creek, the Harvey Coal Company has its No. 1 entry which, 30 yards in, has the following section:

Hazard Coal.

Sandstone.	
Coal	38"
Bone coal	3"
Coal	11"
Altitude, 1260.	

At 50 yards in a second streak of bone coal appears, 2 inches thick and 3 inches above that of the preceding section.

On the left, opposite No. 1 entry, No. 2 entry 40 yards in has but one seam of bone coal, 2 inches thick,

and 51 inches of coal. At 150 yards in, the sample, with analysis (No. G. 3704) given on a preceding page, was taken, the section being as follows:

Hazard Coal.

Sandstone.	
Coal	38"
Bone coal	2"
Coal	11"
Clay.	
Altitude, 1260.	

Coal in stock from this entry is hard, bright and, but for the bone coal, apparently pure, with a comparatively small amount of slack for narrow work alone. The lump coal shows no sign of deterioration although some of it has been exposed to the weather for several months.

On a left branch just above the No. 2 entry, on the left $\frac{1}{8}$ mile up the branch, a prospect gives 26 inches of coal under 4 feet of sandstone at altitude 1,300. On the left, $\frac{1}{4}$ mile up the branch, a second prospect gives 42 inches of coal under 10 feet of massive sandstone at altitude 1,340. The lower one of these openings seems to be of the Hazard bed and the upper of the Flag bed, as indicated by the configuration of the surface of the ground, but additional data is needed to confirm this opinion. If correct, the thin coal of the Hazard opening may be attributed to its proximity to the crest of a roll as indicated by its altitude as compared with that of the No. 2 entry, and of the Flag bed opening.

On the right, $5\frac{3}{8}$ miles up the creek, a prospect into the Hazard bed gives 52 inches of coal at altitude 1,265.

**COALS ON NORTH SIDE OF
NORTH FORK.**

COALS ON THE NORTH SIDE OF THE NORTH FORK OF KENTUCKY RIVER FROM THE MOUTH OF LOTS CREEK TO THE MOUTH OF CARR FORK, INCLUD- ING ALSO THE HEADWATERS OF LOST CREEK.

This report follows a recent examination* of all coal developments which were available in the region it covers, viz.: The Lost creek watershed above Cockerel fork in Breathitt county, and the drainage area of the North fork of Kentucky river on the north side of the river from Lots creek to Carr fork.

New topographical maps, on a large scale, of most of this field issued jointly by the Kentucky Geological Survey and the U. S. Geological Survey, admit of location of openings with a great degree of accuracy, and altitudes marked frequently along streams, roads and hilltops, as well as on the maps, have aided very much in using the barometer for getting heights of openings and determining correlations and inclinations of strata. It should be noted, however, that barometric readings can never be relied upon implicitly, but are often in error and always subject to correction.

Altitudes given in this report, not conforming to those given in the earlier report, are expected to replace the latter.

Beyond mentioning the fact of a general northwest dip throughout this restricted field, it is necessary to say little more here in regard to structure. The closer work done has revealed numerous minor cross dips and reverse dips, some of which are pointed out when treating of the localities where they occur, while others are too obvious to need mention. Outcrop surveys are needed for final determination of local dips before mining opera-

*1912-1913.

tions are begun. This is work for property owners and is now well under way.

With such knowledge of them as is already acquired, the outcrops of two of the beds at least, the Fire-clay and the Flag coals, can be drawn on the map, their areas calculated and from their known thickness the available coal be determined with sufficient accuracy for general purposes. The principal beds above drainage in this region and approximate intervals between them, with the notation locally used to describe them added, are as follows:

Hindman Coal.

Interval 100 feet or more.

Flag Coal (No. 7).

Interval 40 to 80 feet or more.

Hazard Coal (No. 6).

Interval 100 feet.

Haddix Coal (No. 5).

Interval 200 feet or more.

Fire-clay Coal (No. 4).

Three other coals, one a rider to the Fire-clay coal, one midway between the Haddix and Hazard coals, and the third between the Flag and Hindman coals, sometimes assume a workable thickness, but it is very doubtful if they do so over much area. These intervals are variable without apparent regularity, though there seems to be an approach to a uniform increase of interval between the Hazard and Flag coals from 40 feet on Lost creek to 80 feet on Lots creek and possibly to 100 feet on Irishman creek.* The lowest strata exposed are at the mouth of Irishman creek, 160 feet below the Fire-clay coal, and the highest are at the head of Trace fork of Irishman, probably 300 feet above the Hindman coal—in all about 1,000 feet of measures. The lowest 100 feet of these measures carries no coal of value nor any conspicuous rock. At the top of this 100 feet is a thin coal, apparently constant, and underlying a sandstone which forms the lower cliffs at the river above Hazard and carries the Whitesburg coal, (with more or less shale accompanying it), at varying distances below the

*See succeeding report on Carr fork.

Fire-clay coal above it, but normally about 30 feet. The Whitesburg coal, above drainage in this field only at and above Hazard, is in places wholly cut out by this sandstone, but while often carrying enough coal for working is so cut up by partings as to ruin it.

The Fire-clay coal is below drainage on the upper half of Lost creek, its bed section before going under the creek showing partings which give to its three feet and over of coal an unattractive appearance. On Lots creek the upper part of this bed is clean, varying in thickness from workable to non-workable under present conditions. At its thickest it appears in large part as cannel coal. From the mouth of Lots creek up the river to Carr fork and thence to Irishman creek there is a gradual increase in thickness of the Fire-clay coal, but with a number of fluctuations: the upper bench of coal is remarkably constant at 3 to 3½ feet over a large area, while the lower bench adds an increasing amount of coal of doubtful value owing to the impurities in it. The quality of the upper bench is fine for domestic use and for steam, and its uniformity in appearance throughout its thickness is striking. On Carr fork* it is usually without regular cleavage. The peculiar parting in this bed is still more singular in a part of this field in that it consists of two distinct parts, the lower the usual brown (sometimes black) flint-clay, the upper part a combined black slate and fire-clay, sometimes so largely bituminous as to make the closest examination necessary to determine it from splint coal before it is mined. But slowly affected by weather, it is conspicuous in the dumps from entries and often elsewhere on the surface below the bed and serves for identification when entries are closed. To it is applied here the name of "black-jack." A peculiarity in the roof of this coal, seen in so many places as to lead to the impression that it is exceptional otherwise, is that where shale covers the bed on outcrop, on going a few yards underground the shale changes to sandstone; sometimes this flakes off near the mouth but does not farther in. This change occurs even when no sand whatever can be detected outside either by eye or with hammer. This engenders doubt of any

*See Carr fork and its tributaries.

shale which has been exposed to weathering if it may not really be a weathered sandstone.

The rider to the Fire-clay coal shows a fair thickness only on Lots creek and at but one locality there. The adjacent rocks vary from shales and thin sandstones away from the river to thick, massive sandstones in the vicinity of the river which apparently cut out this bed. From these shales or sandstones up to the Haddix coal there is generally an alternation of shales and thin bedded sandstones, the latter predominating and supplying most of the flagstones required for local use.

For a few miles on Lost creek the Haddix coal makes an excellent showing of from three to five feet, but before going below drainage it becomes thin, to reappear on Trace fork of Lots creek with over four feet of coal. Above Trace fork it has been found in a few places only, and where opened in good thickness, the bed is badly cut up by partings. From the Haddix coal to the Hazard coal is largely massive sandstone, the twenty feet of sandstone close under the Hazard being particularly durable, presenting cliffs of that thickness at frequent intervals. Half way between the Haddix and Hazard beds is a thin coal, apparently constant, to which is given the name of "Young" coal.

The Hazard bed, with five and seven feet of coal on Lost creek, is found workable in a few places elsewhere in this immediate field; it seems to be particularly uncertain as to partings, and much more development is needed to give it the assured value which is indicated by its thick coal. Shales of considerable thickness usually overlie the Hazard coal; above these is a cliff-making sandstone up to the Flag coal.

Throughout this field the Flag coal is the most reliable in thickness, ranging from 87 inches of clean coal on Lost creek to over three feet as a minimum, and probably averaging four to five feet. Openings, however, are not so numerous anywhere in the field as to warrant mining without closer investigation in each particular locality where such work may be proposed. Over the Flag coal is a hard, massive sandstone, frequently the roof of the bed, which probably extends to the next coal, about 50 feet higher. Little is known of

this higher coal, as it lies too near the tops of the hills to carry much area. In this report this will be called the "Francis" coal. Next above the Francis coal is a hard, thick sandstone which caps the ridges over a large part of the field.

The Hindman coal, because of its great thickness, nearly ten feet at the head of Irishman creek,* has more local reputation than development, being assumed to maintain that thickness, whereas at the head of Lost creek it appears to be but four feet thick. Between Irishman creek and the head of Lots creek is the only hill high enough to give a workable area of this bed, a large one being needed for a coal so difficult of access as this. The sandstone directly over this coal is extremely friable and makes a bad roof. It is probably 70 feet thick, with a hard cap, which gives rise to many of the peaks in the field. Strata above this sandstone are to be found probably only at Hazard and in the ridge between Irishman and Lots creeks and have not been investigated.

Following is a description in detail of coal openings and natural exposures in this region visited, together with references to former information published. It includes all openings in the field which were in condition for examination at the time, so far as they could be determined, many of them being partly closed. The general use of coal by residents instead of wood as in earlier years, has resulted in such development of the coal beds as to render their correlation far more reliable than under former conditions. The description is arranged in geographical order, beginning at the mouths of the streams and following each one in succession, with its tributaries, to its head. The terms left and right are used invariably as when looking up stream. Surface distances, given in miles, are fairly accurate, having been measured generally on the new maps whenever they were available. Underground distances, given in yards, are all by estimation. Thicknesses of strata, given in feet, are approximate only; given in inches are exact. Altitudes of openings determined by barometer are still subject to correction, usually but slightly so.

*See Carr fork.

Entries are often partially closed at the mouth by fallen earth, so that six inches to a foot of water stands in them; such are designated here as "wet" entries. Names of owners or former owners of lands are given preference to names of companies owning coal, as openings can be more definitely located in that way.

LOST CREEK.

On the left of Lost creek, one-eighth mile below Cockerel fork, and again one-quarter mile above Cockerel, on the left of a small drain, are openings with the following sections:

Fire-clay Coal.

Below Cockerel		Above Cockerel.	
Sandstone	3 ft.	Shale and shaly sand-	
Shale	5 ft.	stone	10 ft.
Coal	25"	Coal	5"
Parting	3"	Shale	1"
Coal	13"	Coal	18"
Altitude, 835.		Shale	3"
		Coal	16"
		Parting	4"
		Coal	10"
		Black slate.	
		Altitude, 840.	
		Altitude of mouth of	
		Cockerel Fork	805

The first opening was measured at the mouth of a long entry, the second at the face one yard in. The partings consist of an indeterminate rock apparently between a common shale and the characteristic flint fire-clay.

One mile up Cockerel fork the Fire-clay coal goes under drainage, but up Lost creek it rises with the stream, being 25 feet above at the mouth of Ten Mile creek and 33 inches thick there without parting. The rider has 26 inches of coal there. The Haddix coal, as found directly opposite and 200 feet higher than the mouth of Ten Mile, has the following section:

Haddix Coal.

Coal	23"
Shale	4"
Coal	4"
Shale	1"
Coal	2"

Altitude, 1015.

TEN MILE CREEK.

On the right and $1\frac{1}{4}$ miles above Cockerel fork. Altitude at mouth, 815.

No satisfactory coal appears to have been found on this creek, those openings made having all fallen in. On the left and over the Left fork divide, however, is an opening on Low Gap branch which encourages the hope that the bed has been overlooked here.

- COLLINS BRANCH.

On the left, $2\frac{1}{2}$ miles above Ten Mile creek.

The section of the Collingsworth opening on the Flag coal is taken from Bulletin No. 11, but with corrected elevation.

Flag Coal.

Clay.	
Coal	15"
Cannel and splint coal	18"
Clay	1"
Coal	16"
Clay	1"
Coal	8"

Altitude, 1195.

LOW GAP BRANCH.

On the right, $3\frac{1}{2}$ miles above Ten Mile creek. Altitude at mouth, 860.

On the right drain of the right fork of this branch, $\frac{3}{4}$ mile from Lost creek, Green Noble has an opening in the Hazard bed giving the following section:

Hazard Coal.

Sandstone	10 ft.
Block coal	13"
Shale	3"
Block coal	1"
Shale	7"
Block coal	31"
Clay	1"
Block coal	20"
Black slate.	
Altitude, 1130.	

But a few inches of the bottom coal was seen, and its 20 inches may include a parting, there being 18 inches of water in the entry.

FIFTEEN MILE CREEK.

Altitude of mouth, 910.

Opposite the mouth of this creek and ten feet above it is eighteen inches of coal under ten feet of shale and upon five feet of sandstone. This is probably the Fire-clay coal rider, the main bed having gone below the creek about a mile farther down stream. A quarter of a mile up Fifteen Mile, on the left and a quarter of a mile up a left branch, the Hazard coal gives in a partly closed, wet entry under fifteen feet of shale, six and a half feet of coal, including thin partings near the top. Its altitude is 1,165. On the Combs and Horton tract, one mile up Fifteen Mile, three openings are shown as follow. Openings on left by the road and one-quarter of a mile up right branch:

Flag Coal.

Shale	5 ft.
Coal	1"
Shale	2"
Coal	61"
Altitude, 1180.	

Ten-yard entry on left of same branch and near its mouth:

Hazard Coal.

Shale	10 ft.
Coal	6"
Shale	1"
Coal	5"
Shale	1"
Coal	69"
Altitude, 1140.	

The lower thirty inches is block coal with plates of splint. That these two similar sections are on separate beds is evident in the passage from one opening to the other. In addition to the shale roof, there is a bed of sandstone between them. The analysis of the Flag coal, taken from Bulletin No. 11, is:

Analysis.

Moisture	2.48
Volatile matter	35.51
Fixed carbon	52.43
Ash	9.58
Sulphur	1.05
Phosphorus	0.033
Specific gravity	1.337
Coke	62.01
Total carbon	70.95
B. T. U.	12,958

At the mouth of the same branch the Haddix coal, or a part of it, 14 inches thick, lies at an altitude of 1,060. From the head of this branch, across the divide, half a mile down Grapevine creek, on its right and below the trail is a ten-yard entry which from its altitude is presumed to be on the Hazard coal. Water in the entry prevented ascertaining the thickness better than is given here and may have concealed a parting at the bottom:

Hazard Coal.

Shale	7 ft.
Coal	1"
Shale	1"
Coal	5"
Shale	1"
Coal	6"
Shale	1"
Coal	60"
Altitude, 1135.	

This opening augers well for continuity in thickness in this direction.

SIXTEEN MILE CREEK.

Altitude of mouth, 925.

On the right, half a mile up, at water level (965) is exposed two feet of coal and shale at the base of a shale cliff about 65 feet high. Two limestone seams about six inches thick traverse this cliff at heights of 35 and 45 feet.

On a left branch, $1\frac{1}{4}$ miles up a two-yard entry, fallen in, still shows somewhat over 5 feet of coal under 18 inches of coal and partings and those under 10 feet of shale. Its exact altitude is 1,192 and is indicative of the Flag coal.

STRONG BRANCH.—On the right, $1\frac{1}{4}$ miles up, has exposed at its mouth (altitude, 995), 30 feet of the shale in the high cliff lower down the creek. A mile up Strong branch, on the right, beside the trail to Grapevine creek, a four-yard wet entry gives the following section:

Hazard Coal.

Sandstone	5 ft.
Shale	12 ft.
Coal	2"
Shale	1"
Coal	4"
Shale	3"
Coal	68"
Altitude, 1165.	

The similiarity in this vicinity of the Hazard and Flag coals, only 40 feet apart, makes correlation especially uncertain in isolated openings. Altitude here is the only guide and that appears to place this coal as of the Hazard bed.

HIRAM BRANCH is on the left, two miles up Sixteen Mile creek. Altitude of mouth, 1,060. On the right, at the mouth of Hiram branch a prospect on the Flag coal gives the following section:

Flag Coal.

Sandstone	24"
Shale	18"
Coal	1"
Shale	6"
Coal	2"
Shale	3"
Coal	52"
Altitude, 1220.	

In this vicinity there is but little difference in the appearance of the Flag and Hazard coals, each being in the main, block coal with more or less splint coal interleaved. In this Flag opening there appears to be a little more splint coal than the Hazard bed has shown. An opening here on the Hazard bed at altitude 1,180, was so fallen in when visited that little coal could be seen, but a thick bed was evident. On the left, at the mouth of the branch, the Haddix coal appears to be cut out by sandstone which forms a 20-foot cliff from the branch. In a drain cutting into this sandstone, $\frac{1}{8}$ mile up the branch, is three feet of alternating coal and sandstone and for the next $\frac{1}{8}$ mile or more, up to the first left-hand branch and in the point of the hill beyond, the stain of the bed is conspicuous at this level. On the left, half a mile up, a prospect five feet above the branch, partly covered, shows some $3\frac{1}{2}$ feet of coal bed with one thin parting visible. This, the Haddix coal, at altitude 1,090, goes below drainage $\frac{3}{4}$ mile up the branch, having there a black slate floor. On the right, one mile up and 20 feet above the branch, the Hazard coal was opened and, partly covered, still shows the following section:

Hazard Coal.

Shale.	
Sandstone	2 ft.
Coal	25"
Shale	6"
Coal	48" +
Altitude, 1180.	

It is probable that the lower 48 inches or more is all coal, giving a bed of somewhat over 6 feet of coal with but 6 inches of parting.

On the left, $\frac{1}{8}$ mile above Hiram branch under 6 feet of shale (in contrast with the exposure along Hiram branch), the Haddix bed has been opened at altitude 1,085. This opening, fallen in, still showed a bed over 5 feet thick, including a parting of 5 or 6 inches about 18 inches from the bottom. The floor is a black slate. This opening, as well as those on Hiram branch, are on Wilson Campbell's land. Coal of unknown thickness, reported taken from the creek, $2\frac{1}{2}$ miles up, altitude 1,120, is probably of the Haddix bed.

LOW GAP BRANCH.

On the left of Lost creek, $\frac{1}{2}$ mile above Sixteen Mile creek. Altitude of mouth, 945.

Shales are exposed on this branch almost completely up to the Haddix coal, which is opened in a right drain $\frac{1}{4}$ mile up and has about 33 inches of coal, without parting, lying under 25 feet of sandstone. Altitude, 1,035.

On the left of Lost creek, $\frac{3}{4}$ mile above Sixteen Mile creek, two short entries, the higher one 100 yards farther up stream than the lower one, gave the following sections:

Haddix Coal.		Hazard Coal.	
Sandstone	7 ft.	Sandstone	6 ft.
Coal	39"	Shale	6 ft.
Knife edge parting.		Coal	15"
Coal	7"	Shale	1"
Altitude, 1030.		Coal	61"
		Altitude, 1140.	

The sandstone over the Hazard bed is here extremely friable. These and the next preceding Low Gap branch opening, are on Mahlon Jones' land.

On the right, one mile above Sixteen Mile, a prospect into the Hazard bed shows, under 5 feet of shale, about 6 feet total thickness, including 9 inches of shale one inch from the top. Altitude, 1,155.

WILL BRANCH.

On the left, $1\frac{1}{4}$ miles above Sixteen Mile creek.

A half mile up this branch, on the right fork and 15 feet above it, Mahlon Jones has a ten-yard entry into the Haddix bed showing 46 inches of coal under 10 feet of sandstone. Altitude, 1,075. This is a hard, bright, block coal containing a little splint.

CAMP BRANCH.

On the right, $1\frac{3}{4}$ miles above Sixteen Mile creek.

No coal in condition to measure was found on this branch, but the following section was obtained:

Cannel coal and black slate (thin).....	1320
Flag coal (?) (prospect)	1210
Coal (reported about 18 inches)	1125
50-foot sandstone	1055
15-foot sandstone	1035

The sandstones are exposed in the bed of the branch from $\frac{1}{4}$ to $\frac{1}{2}$ mile up it and the coals have been incompletely opened on the right $\frac{1}{2}$ mile up. The place of the Haddix coal appears to be in the 5-foot interval between the two sandstones, giving about the usual interval to the Flag coal at 1,210. The 18-inch coal is then probably 30 to 40 feet below the Hazard bed. The cannel coal is probably about 50 feet below the Hindman bed.

On the right of Lost creek, above Camp branch, the Haddix coal has been opened but has been entirely covered again. Apparently a thick coal was found. Its altitude is 1,050.

BOWMAN BRANCH.

On the left, 2 miles above Sixteen Mile creek.

On the left, $\frac{1}{4}$ mile up this branch, N. Combs has a prospect into the Haddix bed, giving nearly or quite 60 inches of clean coal at altitude 1,070. Five feet of shale covers this coal with 15 feet of sandstone over that.

At J. E. Campbell's, on the left, $2\frac{1}{4}$ miles above Sixteen Mile and $\frac{1}{4}$ mile below Rock fork, an entry is driven into the Haddix coal at altitude 1,070, which gives at its mouth 64 inches of coal, but 10 yards in a roll has cut it down to 40 inches. The entry was then driven to the left alongside the roll for about 20 yards and continued in thick coal, 56 inches at the face. The parting seen on an earlier visit is not continuous. The coal is a fine, hard, bright block. Analysis made by the survey of my sample of this coal gave the following results:.

Haddix Coal.

Moisture	2.09
Volatile matter	38.61
Fixed carbon	54.21
Ash	5.09
Sulphur	0.83
Phosphorus	0.007
Coke	59.30
Specific gravity	1.297
Fixed carbon	74.24
B. T. U.	14,018

ROCK FORK.

On the left, $2\frac{1}{2}$ miles above Sixteen Mile creek. Altitude of mouth, 1,040.

In the cliff on the left at the mouth of this fork and 30 feet above it, a thin coal was reported found which is evidently the Haddix, indicating that the roll found in the Campbell entry continues indefinitely up Lost creek. On the left, at the head of Rock fork and $\frac{3}{4}$ mile up, a prospect on Dr. Jones' land gives:

Flag Coal.

Shale	5 ft.
Coal	8"
Shale	2"
Coal	71"
Altitude, 1240.	

This is a block coal, the lower 30 inches hard.

Considerable prospecting appears to have been done above Rock fork in search for the Hazard coal, under the supposition that it might rise with or faster than Lost creek, but without success. The coal is apparently completely cut out by sandstone a quarter of a mile above Rock fork and is certainly under drainage at the mouth of Laurel fork.

LAUREL FORK.

On the right, 1 mile above Rock fork. Altitude of mouth, 1,110.

Massive and thin-bedded sandstones are exposed along this branch with little break to the Hazard coal, but at the mouth of a branch $\frac{5}{8}$ mile up the following intervenes:

Sandstone.

Shale 5 ft.

Coal 3"

Fire-clay 2 ft.

Altitude, 1135.

At the forks of the creek, a mile up, is 22 inches of coal under 8 feet of shale—the Hazard bed or part of it, at altitude 1,170. On the left, a quarter mile up the right fork and 10 feet above it, an incomplete prospect in a broken hillside gives the following in which the upper bench of coal is a squeezed, shapeless mass and the lower bench, partly covered, may contain a parting:

Flag Coal.

Massive sandstone 5 ft.

Coal $2\frac{1}{2}$ ft.

Shale 9"

Coal 4 ft.

Altitude, 1220.

By means of this opening combined with those on the Flag coal on Rock fork and with the Mahlon Jones opening into the same bed, a northwest dip of about 50 feet per mile is found. If the dip were uniform the 22

inches of coal at altitude 1,170 must be at about 1,155 at the mouth of Laurel branch, giving strata practically level to the coal next mentioned up Lost creek, but with their depression here as usual along the main streams, there still remains a slight rise of strata up Lost creek which continues to its head.

On the right, two miles above Rock fork, at Robert Combs' (formerly Fish Napier's) on the right of the hollow, the stain of the Hazard bed shows, unfavorably, under five feet of shale at altitude 1,185 and a new three-yard entry into the Flag coal gives 48 inches of coal under 10 feet of sandstone. Altitude, 1,240.

On the left, 2½ miles above Rock fork and by the road ascending the hill at the head of Lost creek, is an exposure which, combined with an opening beyond, below the road, gives the following:

Flag Coal.

Sandstone	8 ft.
Coal	34"
Hard parting	¼"
Coal	19"
Altitude, 1245.	
Interval (shaly S. S.)	
Sandstone	5 ft.
Shale	5 ft.
Coal	7"
Shale	3 ft.
Altitude, 1215.	

It appears that the Hazard bed is reduced on Laurel fork to 22 inches and to 7 inches here, but it is not impossible that the seam splits and this thin seam represents only a part of the bed and that the main body of the coal is a few feet below.

A reported 48 inches of fine coal on the level of the gap to Lot's creek and 150 yards to the right of it, at altitude 1,405, is of the Hindman bed unless the anticline here is sharper than supposed and the next bed below is brought up to this level.

LOTS CREEK.

The altitude of the mouth of this creek is about 820, that of the highway bridge there being 842.

Heavy sandstone underlying the Fire-clay coal makes a rockhouse into which the highway goes just above the mouth of the creek, about 6 inches of coal at altitude 835 (probably an off-shoot from the Whitesburg coal), showing at the base of the cliff. Farther up the creek the road rises to the top of that sandstone and the stain of the Fire-clay bed is visible in several places and the sandstone above it has become shaly giving place almost altogether to shale farther up the stream. An opening into this bed on the Dark fork (Helen Combs) branch, is taken from Bulletin No. 11 with corrected altitude:

Fire-clay Coal.

Sandstone	20 ft.
Shale or S. S.....	18"
Coal	37"
Altitude, 890.	

TRACE FORK.

On the left, 1 mile up Lots creek. Altitude of mouth, 825.

On the right, one mile up, the Holliday entry on the Fire-clay coal shows 41 inches of coal, with one inch parting three inches from the top, at altitude 890. The bed goes below drainage $1\frac{1}{4}$ mile up, $\frac{1}{4}$ mile above Jake fork, about where two inches of coal, a remnant possibly of its rider, shows on the right under 20 feet of sandstone and above 4 feet of shale.

LOST CREEK ROAD FORK.

On the left of Trace fork and $1\frac{1}{2}$ miles up it.

On the right, a mile up this fork, the Haddix coal is opened in a long rockhouse and also beside its eastern end. From these places the following measurements were obtained:

Haddix Coal.

Under Cliff.		10 Yards East.	
Coal	38"	Coal	34"
Shale	30"	Shale	11"
Coal	3"	Coal	19"
Shale	3"	Altitude, 1160.	
Coal	16"		

The correspondence in thickness of the two coal seams of this eastern section with those of the Flag coal at the head of Lost creek, would ordinarily lead to their correlation, but there is no other reason for supposing such an extreme reversal through Lost mountain, of the general dip as that would entail. Even assuming the Road fork opening to be of the Haddix bed (which is done with confidence) and the Fire-clay coal to be 200 feet under it, a slight dip down stream and against the general dip is involved. Following the road up from this coal the bench of the Hazard coal is very evident at altitude 1,245 and 35 feet of sandstone above the Flag coal at altitude 1,300. Forty feet more of sandstone shows from 1,365 to the gap at 1,406 where the Hindman coal should be found: 30 feet above the gap some 40 to 50 feet of sandstone cliffs appear.

PIGEON ROOST ROAD FORK.—On the right of the Lost creek road fork, $\frac{3}{4}$ mile up from Trace fork. Altitude of mouth, 1,000.

In the point of a hill where it is likely coal in a normal condition could not be found, a quarter mile up this fork, an old prospect gives:

Haddix Coal.

Sandstone	2 ft.
Coal	15"
Shale	1"
Coal	15"
Shale	10"
Coal (possible)	24"
Altitude, 1115.	

Under this prospect an exposure shows:

Shale	30 ft.
Black slate	6"
Fire-clay	18"
Altitude, 1045.	

Apparently the Hamlin coal is cut out here.

By the road, $\frac{3}{4}$ mile up, a foot of coal and shale on a 10-foot sandstone cliff appears to represent at least a part of the Haddix bed at altitude 1,130. In a branch on the right, $\frac{7}{8}$ mile up, thin bedded sandstone occupies the apparent place of the Haddix bed at 1,125 to 1,130 and 35 feet of massive sandstone lies directly on that, but an error in heights is possible or the coal may have dipped below the sandstone. A quarter mile up and in the branch, coal reported 23 inches thick has been opened. Nearby, on the head of Trace fork, this coal lies 55 feet above the Haddix bed. On the left of the road, a few yards up from the foot of the hill and one mile from the Lost creek road is:

Flag Coal.

Massive sandstone	5 ft.
Shale	10 ft.
Hard, block coal	46"
Altitude, 1260.	

At water level, two miles up Trace fork the following section is exposed:

Sandstone	5 ft.
Shale	15 ft.
Black slate	6"
Coal	1"
Shale	1 ft.
Sandstone	2 ft.
Altitude, 1030.	

The black slate here is evidently the same as that on Pigeon Roost Road fork at altitude 1,045.

On the left at this point is a prospect into the Flag coal which is remarkably similar to the one given on Pigeon Roost branch of Troublesome creek:

Flag Coal.

Sandstone	3 ft.
Coal	34"
Black slate	12"
Shale	5"
Coal	11"
Shale	2"
Coal	4"
Altitude, 1310.	

On the left, $\frac{1}{8}$ mile farther up, is an opening now closed, into the Haddix bed at altitude 1,150. This was given in Bulletin No. 11 as "Hazard." The section is:

Haddix Coal.

Shale	5 ft.
Coal	11"
Shale	13"
Coal	38"
Altitude, 1150.	

Opposite this, on the right of Trace fork, the Hazard coal is now open in a twenty-yard entry as follows:

Hazard Coal.

Shaly sandstone	3 ft.
Shale	2 ft.
Coal	53"
Altitude, 1250.	

Between the Haddix and Hazard beds is here reported a coal 18 inches thick, the Young coal, at altitude 1,205. These Trace fork openings are on land of Charles Godsey.

JAKE FORK.—On the right, 1 mile up Trace fork. Altitude of mouth, 880.

The Fire-clay coal, lying nearly level, goes under this stream about $\frac{1}{4}$ mile up it and beyond this the shales of the high cliff on Fifteen Mile creek of Lost creek are recognized, but with some variations. At water level, $\frac{3}{4}$ mile up, is five feet or more of black slate, altitude 920, and $1\frac{1}{4}$ miles up the following section with base at the creek:

Sandstone	15 ft.
Shale	18"
Coal	6"
Fire-clay	2½ ft.
Shale	5 ft.
Altitude, 940.	

One-eighth mile farther up three thin coals appear in the 10 feet of shale under the sandstone.

SANG FORK.—On the left, 1½ miles up Jake fork.

On the right, ¾ mile up, a wet entry gives at its mouth 47 inches of coal under 5 feet of sandstone at altitude 1,220. The under surface of the sandstone undulates in slight curves, the top of the coal apparently conforming to this uneven surface. The entry is probably in the Hazard, though, according to the altitude obtained, it appears to be too high for that bed, and therefore was previously doubtfully ascribed to the Flag bed.

On the left of Jake fork, a quarter of a mile above Sang fork and the same distance due south of the preceding entry, the same bed at the same height, has 50 inches of coal, the lower 20 inches particularly bright, rich looking and hard. Thirty feet below both of these openings is a prominent bench, altitude 1,190, some 20 feet below which should be the Young coal.

On the right of a right branch, 2½ miles up Jake fork, Noah Smith has an abandoned entry in which 1½ feet of coal could be seen; the bed is probably 4 feet or more thick, under 5 feet of shale and shaly sandstone. It is the Haddix coal at altitude 1,160. On the same land, ⅛ mile farther up Jake fork, a seven-yard entry gives the following:

Flag Coal.

Sandstone	4 ft.
Coal	21"
Blackjack	3"
Shale	3"
Coal	13"
Altitude, 1300.	

On the point of the spur between these two Smith openings an uprooted tree has exposed an abundant stain of the Hazard bed at altitude 1,255.

Going up the left fork from the Smith openings, strata are seen to rise with unusual rapidity, faster than the rise of the creek, and shales continue conspicuous. At $2\frac{7}{8}$ miles up, on the right of the upper left fork, a covered prospect gives coal at altitude 1,145 with 5 feet of sandstone 10 feet above the bottom of the cut and 20 feet of shale below it to near drainage level. On the left, at the head of this fork, 3 miles up, a closed opening shows a coal bed $4\frac{1}{2}$ to 5 feet thick under 10 feet of shales. This is said to have been recognized as of the Flag bed although its altitude, 1,405, is above even that which the observed rise of the strata along the creek leads one to expect, involving a rate from the Smith opening of about 200 feet per mile. Assuming it to be the Flag bed, the high hill in which it is opened appears to be a center from which strata dip in all directions. With such the case, the coal at altitude 1,145 is then the Hamlin.

On the left, at the mouth of a branch of Lots creek opposite Trace fork, the Fire-clay coal is opened 32 inches thick with 4 inches of shale and then sandstone above it, altitude 885. On the left, by the road, $1\frac{1}{4}$ miles up Lots creek, the following section was taken:

Fire-clay Coal.

Massive sandstone	20 ft.
Shale, containing coal	2 ft.
Shale	 2 ft.
Coal	36"

On the right, $2\frac{1}{4}$ miles up Lots creek, a twelve-yard entry into the Fire-clay coal gives a thickness of coal of 38 inches at (exact) altitude 889. For other openings into this bed and its rider along this creek, reference is made to Bulletin No. 11, pages 93 and 94. Under the D. Grigsby opening is 20 feet of thin bedded sandstone, then 10 feet of shale on one foot of coal, then 3 feet of massive sandstone to the creek. This one foot of coal dips into the creek 10 yards down it. The

upper opening, on the right, $2\frac{1}{2}$ miles up, has now a long exposure above the creek from which the following section was obtained, excepting that of the cannel coal, which being now covered, its earlier measurement is repeated. The two beds are about 20 feet apart.

		Massive sandstone	15 ft.
Rider.....	{	Coal	25"
		Shale	8"
		Coal	25"
		Shale	10 ft.
		Sandstone	0 to 5 ft.
Fire-clay Coal.....	{	Coal	24"
		Slate	2"
		Cannel coal	22"
		Altitude, 900.	

On the left, about 3 miles up the creek, the Hazard bed, with 3-inch parting separating two seams of coal each 22 inches thick, lies at altitude 1,185.

On the left, $5\frac{1}{2}$ miles up, opposite the mouth of Elk fork, the following section is exposed:

Massive sandstone	15 ft.
Coal	
Interval	10 ft.
Thin coal.	
Parting	1 ft.
Thin coal.	
Interval	20 ft.
Sandstone	5 ft.
Coal	27"
Shale and S. S. to	
creek	20 ft.
Altitude of lowest coal,	965.

Whether the above 27 inches of coal is of the Fire-clay bed or its rider, is doubtful, but the probability seems to be that both beds are represented in the several coals shown.

ELK FORK.

On the right, $5\frac{1}{2}$ miles up Lots creek: Altitude of mouth, 945.

Nothing new has been found on this fork, but the 54 inches of clean coal on the upper right fork given in Bulletin No. 11, page 95, is evidently, under later developments, too high for the Hazard bed and is of the Flag bed. Its corrected altitude is 1,325.

CLEAR FORK.

On the left, 6 miles up Lots creek: Altitude of mouth, 960.

On a branch on the left, $\frac{3}{8}$ mile up Clear fork, on the left, $\frac{1}{4}$ mile up it, Sylvester Grigsby has an entry into the Hazard* coal at altitude 1,305, giving 58 inches of clean coal under 15 feet of sandstone—the lower third thin bedded. This is on a good bench and the top of the cliff rock on which is the Haddix* bed, shows 40 feet below.

On the left of Clear fork, $1\frac{3}{8}$ miles up it, Washington Martin has a five-yard entry into the Hazard coal at altitude 1,270: the coal, having 10 feet of sandstone above it, is 60 inches thick, the top 4 inches rather shelly, the rest good block coal, the under half hard. A broad bench lies about 40 feet below.

On the right of a left branch, $1\frac{1}{2}$ miles up Clear fork and $\frac{1}{8}$ mile up the branch, an old prospect into the Haddix bed on this same broad bench at altitude 1,220, found evidently only thin coal, now covered. On the right, $\frac{1}{4}$ mile up the branch, Washington Martin has a four-yard entry with 60 inches of coal which has here as roof 8 feet of clay shale in place of sandstone.

On the right of a left branch, $1\frac{3}{4}$ miles up Clear fork and on the left of a left branch 100 yards beyond, Benjamin Stacey has ten-yard and six-yard entries with the following sections:

*These coals were correlated as Flag and Hazard in former reports.

Hazard Coal.

Shale	8 ft.
Coal	20"
Mother coal	1/4"
Coal	46"
Altitude, 1315.	

Hazard Coal.

Shale	3 ft.
Massive sandstone	2 ft.
Coal	63"
Bituminous shale	1"
Altitude, 1310.	

A 20-foot cliff is prominent about 40 feet above this bed which lies here 15 to 20 feet above a bench.

On the left, by the road, $6\frac{1}{2}$ miles up Lots creek, the highest coal of those shown opposite the mouth of Elk fork, 60 feet above it, has 2 feet of coal including two thin partings, under 5 feet of sandstone.

On a right branch, 7 miles up, a flagstone quarry on the left at the mouth of the branch, lies at altitude 1,185, while farther up the branch a bench at 1,205 marks the place of the Haddix coal. A second bench and spring by the path beyond, seem to show the location of the Young bed between the Haddix and Hazard at altitude 1,270. At the branch a half mile up it the following is opened in a ten-yard entry:

Flag Coal.

Sandstone	15 ft.
Shelly coal	3"
Rich block coal	23"
Hard block coal	30"
Slaty coal	6"
Altitude, 1345.	

Besides these variations in the coal there is from 0 to 6 inches of slaty coal 2 feet up from the bottom.

On the left of a right hollow, $7\frac{3}{4}$ miles up Lots creek and just below Cordia P. O., B. W. Combs has an eight-yard wet entry into the Flag bed at altitude 1,390, giving 53 inches of coal under 2 feet of massive sandstone with thinner bedded sandstone above. On the way to this entry an uprooted tree showed a considerable stain of the Hazard bed at 1,345. On the point of the hill to the left by the Combs house, the following section was obtained:

Bench	1,150
Shaly sandstone..... (5 feet).....	1,135
Mostly shaly sandstone.	
Thin coal stain	1,105
Mostly shaly sandstone with iron ore.	
Black slate	1,090
Shaly sandstone.	
Bastard limestone..... (1 foot)	
Thin coal	1,060
Shaly S. S. and shale.	
Coal, reported 20"	1,035
Shale	(8 feet)
Coal, reported 20"	1,025
Shale	(7 feet)
Coal, reported 30"	1,015
Fire-clay	(3 feet)
Creek at Cordia	995

The three lower coals probably represent again the Fire-clay coal and its rider.

DICKSON BRANCH.

On the right, $8\frac{1}{4}$ miles up Lots creek: Altitude of mouth, 1,005.

On the left of the branch, $\frac{1}{8}$ mile up it and 15 feet above it, a two-yard entry into what is probably the upper seam of the rider, gives 31 inches of coal at altitude 1,050, covered by 4 feet of shale with calcareous concretions under 10 feet of shaly sandstone.

At the branch, $\frac{1}{2}$ mile up, is the following:

Black slate	10 ft.
Coal	8"
Shale	5 ft
Coal.	
Shale with coal	10 ft.
Shale to creek at altitude, 1,100	15 ft.

Such a thickness of black slate as is exposed at the top seems to be entirely out of place, but it is at a level where exposures are few. Above this section, on the left, Alexander Smith has a four-yard wet entry into

the Flag coal at altitude 1,385. There is somewhat over $4\frac{1}{2}$ feet of coal here, the bottom half a hard block with a streak of bony coal on top of it. The roof is a waving sandstone with shale filling the rolls so that the coal has a level top, differing in that respect from the Sang fork of Jake fork coal. A bench of the Hazard bed lies about 60 feet below this coal.

Coal 18 inches thick containing considerable pyrites, is reported to have been taken from the creek, $\frac{1}{8}$ mile below Elie P. O., at the junction of Youngs fork and Kelly fork. It is probably the middle one of the three seams at Cordia and the main Fire-clay coal may be assumed to lie at Elie at altitude 1,050, 10 feet under the creek.

YOUNG'S FORK.

On the left, $9\frac{3}{4}$ miles up Lots creek. Altitude of mouth, 1,060.

On the left, $\frac{1}{4}$ mile up this fork, the upper one of the rider seams is but just above the creek, and shows 26 inches of coal at altitude 1,075, lying on black slate and under 8 feet of shale covered by 25 feet of sandstone and shale.

BUCK BRANCH.—On the left, $\frac{1}{2}$ mile up Young's fork.

At the branch, $\frac{3}{4}$ mile up it, Mansard Young has an opening into the Hazard coal at altitude 1,385, reported to be $4\frac{1}{2}$ feet thick without parting. The 3 feet of coal visible when visited has 2 inches of bone coal 6 inches from the top. Upon the coal is 6 feet of shaly sandstone and then 20 feet of massive sandstone.

On account of the similarity in thickness of coal of this opening with the Flag entries near Cordia and on Dickson branch, and equal altitude with the latter, correlation with them has been heretofore assumed on the supposition of a northwestward general dip. The fact has not been noted before that the general dip in the area enclosed by lines from Hazard to the mouth of Carr fork, thence to Hindman, to Dwarf and return to Hazard is southwestward. This is most clearly shown

by altitudes given in these pages of the Fire-clay coal bed.

With this the case the Buck branch coal falls below the entries on Dickson branch and near Cordia, and is confidently correlated with the Hazard stain found near the latter at altitude 1,345.

While the general dip within this area is as stated, it may be found in different localities varying in any direction west of north or south.

Following the Flag coal from Hazard up Lots creek and the Hazard coal up Troublesome until they met in apparently one bed provided a difficult problem to solve and led to errors of correlation, which it is believed are now all corrected.

On the right of the left branch of Youngs fork, which the road to Beaver creek follows, $1\frac{3}{4}$ miles up Youngs fork and $\frac{1}{4}$ mile up the branch, Reese Young has a twelve yard entry with the following section:

Hazard Coal.

Massive sandstone	10 ft.
Covered	15 ft.
Sandstone roof.	
Coal	 3"
Bony coal	 4"
Coal	 6"
Hard, block coal	38"
Altitude, 1420.	

The bony coal is dull black and heavy, but gives a black streak and is said to burn to fine ash, but the next coal opening shows an impending parting here.

At 2 miles up Youngs fork, on John Young's land, coal has been raised from the creek said to be 3 feet or more thick, half as much being in sight when visited. It is of the Haddix bed at altitude 1,340. At a point 5 feet lower in the branch a part of the bed has broken off and lies at a steep pitch showing about 2 feet of coal, with possibly more washed away and with black slate and shale under it, which seems to correspond with a parting in the bed on Elk Lick fork and is probably one here.

Up the steep branch, at altitude 1,370, is an old pros-

pect into coal said to be thin, under a 20-foot cliff-making sandstone. On this sandstone which gives rise to a broad bench here, at altitude 1,390 is the probable place of the Young coal. The Hazard coal is opened in an entry directly to the left of the coal in the creek, nearly vertically over it, and with the following section:

Hazard Coal.

Sandstone	8 ft.
Block coal	14"
Shale	13"
Block coal	44"
Black slate.	
Altitude, 1440.	

An inch of coal 2 inches from the top is slightly bony.

ELK LICK FORK.—On the right, $11\frac{1}{4}$ miles up Young fork. Altitude of mouth, 1,140.

On the right, $\frac{3}{4}$ mile up this fork, the 20-foot sandstone cliff shows again at altitude 1,345 to 1,365. A mile up, at William Young's, the Haddix bed has the following section, as measured along the creek bed where it is almost fully exposed:

Haddix Coal.

Shaly sandstone.	
Coal	31"
Black slate	4"
Shale	6"
Black slate	2"
Clay	2"
Coal	14"
Altitude, 1325.	

The thickness given of each coal seam may be slightly in error.

KELLY FORK.

On the right, $9\frac{3}{4}$ miles up Lots creek: Altitude of mouth, 1,060.

Apparently the upper of the three Fire-clay and

Rider coals goes below drainage $\frac{1}{4}$ mile up this fork, where it shows a foot thick with no bottom found: Altitude, 1,075. At Thomas Kelly's, a mile up, thin coals appear above his house at altitudes 1,185 and 1,200, under his flagstone quarry, which latter is at 1,255, with shales and shaly sandstones between. The quarry is probably close under the Haddix coal as on the branch below Cordia, $7\frac{3}{4}$ miles up the creek.

On the right, $1\frac{1}{8}$ miles up, Benjamin Everidge has opened the Haddix bed about at the same level as it was found on Elk Lick fork, with following section:

Haddix Coal.

Sandstone	5 ft.
Shale	5 ft.
Hard, block coal	29"
Shale	3"
Coal	1"
Shale	1"
Very hard, block coal	7"
Altitude, 1325.	

This opening is on a broad bench; the height and character of the bed are the main factors in the correlation.

Assuming the Fire-clay coal to be at altitude 1,050 at the mouth of Kelly fork and to rise uniformly to its upper opening on Trace fork of Irishman creek, it should be at altitude 1,065 at this opening, and on this supposition the opening might be of either the Young or Hazard bed, but the findings on the head of Yellow creek, a half mile south, lead to the conclusion that there is an anticline between Kelly fork and Carr fork waters, slight at the head of Irishman creek, but with crest running nearly level along the dividing ridge, amounting to 100 feet rise at the head of Yellow creek. This makes a rather rapid rise of strata toward Yellow creek and also puts the Fire-clay coal nearer to the Everidge opening than if the rate were uniform to Irishman creek.

From $\frac{1}{4}$ mile up a right branch 2 miles up the fork, coal, partly splint, has been taken, said to be

2 feet thick. Its altitude is 1,415 and it is probably of the Young bed, very likely the upper seam with more coal under what was supposed to be the floor.

On the left of the fork and right of the road, $2\frac{1}{4}$ miles up it, coal, partly splint, has been taken reported to have 3 feet of coal at the top, a parting, and 3 feet more at the bottom including two partings, one of them thick. This report bears considerable resemblance to the bed section at the Everidge opening, and its altitude of 1,400 places it in the Haddix bed.

On the left, $2\frac{1}{2}$ miles up the fork, the same bed at about the same height has been opened, but was closed when visited and only $2\frac{1}{2}$ feet of coal was seen of an apparently thick bed covered by 15 feet shale.

On the right, 3 miles up Kelly fork, an apparently thin coal was found at altitude 1,505, which may be of the Hazard bed, and there is a broad bench at 1,585 possibly indicating the place of the Flag bed. With the hill over this bed rising here some 300 to 400 feet higher, a good working area of the Hindman bed is assured and its 8 to 10 feet of coal should be prospected for at some point nearer than the head of Irishman creek, where it has been found.

UPPER SECOND CREEK.

The Fire-clay coal at the mouth of this stream is, as at the mouth of Lots creek, about 60 feet above the river. The bed rises slightly up stream but is only 15 feet above drainage, $1\frac{1}{2}$ miles up. Following are bed sections:

Fire-clay Coal.

Entry on the Right, $\frac{3}{4}$ Miles Up.

Shale	8 ft.
Coal	2"
Shale	2 ft.
Coal	42"
Flint clay	5" +
Coal	5" +

Altitude, 895.

James Payson's 20-Yard Entry, On the Right, $1\frac{1}{2}$ Miles Up.

Shaly sandstone	10 ft.
Coal	41"
Flint clay	4"

Altitude, 905.

In the first the fire-clay parting has an uneven, knobby surface which may give a variation of an inch in the thickness of the coal above it and of the parting, according as measurement is from the top of a knob or not. The under coal is given approximately at 5 inches. In the upper entry, the middle one of a group of three, the coal measures 41 inches at the mouth and face and 43 inches at the mouth of the entry next above. The fire-clay forms the floor of the entries with probably more coal below. This bed appears not to have been opened on this creek above this group of entries.

COMBS FORK.—On the left of this fork, $2\frac{1}{2}$ miles up it, beside the bridle path to Elk fork is a five-yard wet entry from which the following was obtained:

Flag Coal.

Sandstone	5 ft.
Coal	37"
Clay	6"
Altitude, 1280.	

The depth of the entrance cutting admits of a few inches more coal below the clay which was found to be over 6 inches thick, but if there is any coal below, it can hardly be of much importance.

On the left of the main creek, $\frac{3}{4}$ mile up from the mouth of Combs fork, and by a path crossing to the latter, an old prospect gives the height of the Flag coal as 1,250.

On the right, $1\frac{1}{4}$ miles above Combs fork, and on the left, $1\frac{1}{2}$ miles up, the Hazard coal gives the following:

Hazard Coal.

Ben Stacey—Wet Entry—On right.

Slipped coal.	
Clay.	
Coal	8"
Shale	8"
Coal	12"+
Shale	17"
Coal	37"
Altitude, 1220.	

James Stacey—5-yard entry—On left.

Sandstone	7 ft.
Block coal	40"
Altitude, 1235.	

The lowest two feet of this coal, like much of the Flag coal at bottom, is a hard block. The higher seams of the coal on the right were not in condition for exact measurement; their entire absence on the left is noteworthy.

Fifty feet above the Benjamin Stacey entry is a prospect into the Flag coal, partly covered, apparently about 4 feet thick. Altitude 1,270.

James Stacey also has the Flag bed opened in a wet entry on the left in front of his house, $1\frac{3}{4}$ miles above Combs fork, in which a bed $4\frac{1}{2}$ feet or more thick is evident under 8 feet of shale. About 3 feet of coal at the top was visible. Like the preceding it lies 50 feet above the Hazard bed; its altitude is 1,285.

WALKER BRANCH.

The uniformity of the Fire-clay coal in this region made unnecessary a second visit to this branch. The 38 inches top coal, 5 inches fire-clay and coal below, generally not mined and therefore seldom exposed for measurement, seems to be standard for this vicinity.

On the left at the head of this branch is the following: (An opening is said to have been made into the Flag coal directly above it.)

Hazard Coal.

Five-yard wet entry.

Shaly sandstone.

Block coal 39"

Hard coal 16"

Altitude, 1240.

A coal stain on top of the ridge toward Hazard, at altitude 1,465, is the only sign north of the Kentucky river, of a bed above the Hindman, yet seen by the writer. This appears to correspond with the highest coal of Flint Ridge.

HAZARD AND VICINITY.

The following section and analysis are of the Fire-clay coal half a mile below Hazard (taken from Bulletin No. 11, page 96) :

Fire-clay Coal.

Shale and shaly S. S.	
Coal	34"
Flint clay	5"
Coal	4"
Bone coal	1"
Shale	11"
Coal	4"

Analysis.

Moisture	1.50
Volatile matter	33.50
Fixed carbon	61.20
Ash	3.80
Sulphur	0.794

Specific gravity, 1.287.

Centrally located in the town of Hazard, a quarter mile up the small branch with mouth by the river bridge, the Speak mine is worked by the Speak brothers in the Fire-clay bed at altitude 930, the river being there at about 840. The coal where measured, some 50 yards in, is 37 inches thick, including 2 inches of slaty coal at the bottom which sticks to the floor and in hand-mining is left. The whole seam is said to range in the mine from 37 to 46 inches. At the mouth 15 feet of shale covers the coal, but the roof is fairly good, doubtless becoming sandstone farther in. Besides filling a large part of the local demand for coal, some is shipped by rail after hauling across the river in wagons. One coal-cutting machine is used, operated by compressed air.

On the right, at the head of this branch, the Hazard bed has been opened by a prospect, and coal about 39 inches thick is in sight, at altitude 1,230, under 7 feet of shale. Another seam of the bed beneath the 39 inches is quite possible.

On the branch at the upper end of town, $\frac{3}{4}$ mile up, three entries on the Fire-clay coal give each 38 inches

of coal, including about 6 inches of slaty coal at bottom. The characteristic fire-clay is below that. A fourth five-yard entry on the right has but 30 inches of coal mined. Altitude, 940.

At the sharp bend of the river, $1\frac{1}{4}$ miles above Hazard an entry has been made into the same bed on the right, $\frac{1}{8}$ mile up the branch there. The good coal is 34 inches thick, the floor a black slate rather than slaty coal, roof a cliff sandstone of 40 feet thickness, which has permitted setting of posts 20 feet apart in each direction without perceptible strain.

Higher coals were searched for on this branch, but nothing satisfactory found, apparently. Nearly the whole face of the hill on the right seems to have broken and slipped.

At the mouth of this branch the following section, was obtained:

	Sandstone	20 ft.
Fire-clay Coal..... Altitude, 935.	{ Coal	35"
	{ Flint fire-clay	7"
	{ Coal	3"
	Clay.	
	Sandstone	60 ft.
	Shale	5 ft.
	Black slate	5 ft.
Whitesburg Coal.....	Coal (12 partings).....	40"
Altitude, 890.	River, 845.	

The Kentucky Jewel Coal Company is preparing* for an operation on and below Raccoon creek, 2 miles above Hazard. The intention seems to be to mine at present only the Flag coal, an old entry into the Fire-clay coal on the river front not having been reopened nor other work on that bed begun.

Above the Fire-clay coal an old flagstone quarry, 230 feet higher, appears to be at the base of the Haddix coal. The Flag coal entries, reached via line for incline from the river frontage, are on the left, perhaps a half mile up Raccoon creek, and are 365 feet, by barometer, above the Fire-clay coal opening. The northern of two well begun entries gives the following section:

*Written in 1913.

Flag Coal.

Sandstone	5 ft.
Block coal	30"
Bony coal	3"
Block coal	15"
Shale	3"
Coal	4"

The bony coal may perhaps be classed as poor splint coal.

A broad bench at the top of the proposed incline, 40 feet below this coal, shows the place of the Hazard coal.

GREGORY BRANCH.

The Raccoon Coal Company is operating $3\frac{1}{2}$ miles above Hazard to a small but increasing extent, on the Fire-clay coal on the right of this branch at its mouth, and is building an incline to bring the Flag coal to the same point.

The main Fire-clay coal opening is about 80 feet above the track and at altitude 960. It was started in the point of a hill and runs rather across the point. The coal at entrance is but about 6 inches thick above and below the 6 inches of parting, and is some 6 to 8 feet above the normal level of the bed. At 20 yards in, where normal level is reached, the top coal is 40 inches thick, which is, perhaps, the average thickness in the mine: Its maximum is said to be 46 inches.

The coal seems to be in great demand at a good price, in spite of the fact that it is much broken up in the long chute from mine to railroad level. Following is an analysis of the coal as obtained at the mine: Analysis by James A. Gibbony.

Analysis.

Water	1.52
Volatile matter	39.06
Fixed carbon	55.78
Ash	3.64
	100.00
Sulphur	0.634

The Flag coal is opened fronting the river near to the head of the proposed incline 375 feet above the Fire-clay coal: Altitude, 1,335. Barely underground it gives 47 inches of coal, with 8 inches of shale and then 8 feet of sandstone above it.

On the left of a left branch, $\frac{1}{4}$ mile up Gregory and $\frac{1}{8}$ mile up the branch, the following section was obtained at the mouth of a wet entry:

Fire-clay Coal.

Sandstone	6 ft.
Coal	33"
Flint clay parting.	
Fire-clay.	
Altitude, 950.	

The rider shows here about 18 inches of coal, at altitude 970.

On the right at the head of this branch, an old opening showed in the dump blocks of heavy splint coal and some block coal. The bed may be 3 feet thick: Its altitude is 1,295, making it the Hazard bed.

On the right, $\frac{1}{2}$ mile up Gregory, the following section was obtained:

Gap	1,430
Prospect: Apparently 3 to 4 feet of coal, largely splint, which weathers into small thin plates like black slate	1,365
(In this report this bed is given the name of "Francis.")	
Flag coal prospect: about 5 feet without parting, under 5 feet shale	1,310
Hazard 3-yard entry: Coal 43 inches, under 5 feet of shaly sandstone	1,260
Broad bench (Young coal?)	1,225
Prospect: Coal 17 inches under 5 feet shale.....	1,025
Fire-clay coal level	950

On the left nearly opposite these the following was obtained at a five-yard entry:

Fire-clay Coal.

Sandstone	10 ft.
Shale	2 ft.
Coal	36"
Flint clay	3"
Coal	4"
Altitude, 950.	

In the point of a hill on the right between the forks $\frac{3}{4}$ mile up, 30 feet of shaly sandstone is exposed at altitude 1,035 over coal which is probably the 17 inches coal at 1,025 of the preceding section. Certainly the continuation of thin lamination below the Haddix bed is shown.

On the left, a mile up, the Hazard bed has the following section:

Hazard Coal.

Shale	5 ft.
Coal	4"
Shale	6"
Coal	5"
Shale	6"
Coal	2"
Shale	2"
Coal	9"
Shale	6"
Coal	36"
Fire-clay.	
Altitude, 1215.	

And to the right above it the Flag coal this:

Flag Coal.

Shale	3 ft.
Coal	53"
Shale	3"
Coal	6"
Altitude, 1275.	

Other openings into the Fire-clay coal by the road above Gregory branch are given in Bulletin No. 11, pages 99 and 100.

BEAR BRANCH.

Four and one-half miles above Hazard: Altitude of mouth, 870.

On the left, $\frac{3}{4}$ mile up this branch, is a twelve-yard entry with the following section:

Flag (?) Coal.

Shale	10 ft.
Coal	2"
Shale	4"
Block coal	8"
Splint coal	15"
Block coal	8"
Hard block coal	23"
Altitude, 1360.	

The bottom coal has an inch of bone which appears not to be continuous.

The ascertained height of this bed above the Fire-clay coal, and its thickness, are indicative of the Flag coal, but the splint coal in it, apparently perfectly good, weathers into small thin fragments like black slate, to a degree never seen by the writer elsewhere than here and in the coal found above the Flag on Gregory branch. A possible error of 40 feet in altitude would throw this opening into the higher bed.

On the left, by the road, $4\frac{3}{4}$ miles above Hazard, the following was obtained at the mouth of a wet entry:

Fire-clay Coal.

Sandstone.	
Shale	3 ft.
Coal	1"
Shale	3"
Coal	39"
Flint clay	3"
Bottom (?) clay.	
Altitude, 975.	

On the left, by the road, $5\frac{1}{4}$ miles above Hazard, an exposure gives:

Whitesburg Coal.

Sandstone	40 ft.
Shale	3 ft.
Black slate	5 ft.
Coal and shale	1½ ft.
Shale	6 ft.
Coal	1½ ft.
Altitude, 920.	

BUCKEYE CREEK.

Five and three-quarter miles above Hazard. Altitude of mouth, 875.

On the right of the left fork and at its head two miles from the river, a twelve-yard entry gives:

Flag Coal.

Sandstone	15 ft.
Shale	0 to 12"
Shelly coal	12"
Splinty coal	12"
Bony coal	1"
Hard block coal	43"
Altitude, 1370.	

The inch of bony coal is almost inseparable from the coal below, but does not seem to be very impure. The variation in thickness of shale is due to an even top to the coal and a waving sandstone above it. On removal of the coal the shale comes down, leaving a fine roof, taken advantage of here in the width of the entry driven.

**COALS ON SOUTH SIDE OF
NORTH FORK.**

COALS ON THE SOUTH SIDE OF THE NORTH FORK OF KENTUCKY RIVER FROM CAMPBELLS CREEK TO BIG CREEK, INCLUSIVE.

This report treats of the coals in Perry County on the south side of the North fork of Kentucky River, and its tributaries from Campbell creek to Big creek inclusive. Since earlier reports were made for the Kentucky Geological Survey covering this region many new openings into the coal beds have been made, and after having visited nearly all of them in condition for inspection a nearly accurate estimation of the field is believed obtainable from the data acquired and here presented.

During the investigation a survey was made of the creeks by the Kentucky Geological Survey, the results of which are embodied in the accompanying map, on which also are located the openings visited.

The topography of the region is like that generally of Eastern Kentucky, a succession of narrow valleys with steep sides to the tops of sharp serrated ridges, though at the main head of Campbell creek the country is somewhat more open. Campbell and Forked-mouth creeks have especially narrow valleys with practically no bottom land, and the North fork in this region has also comparatively little for so large a stream.

Altitudes range from 795, that of the North fork at the mouth of Campbell creek, where the hills are some 500 feet higher, to about 2,000 feet at the head of Big creek, where they rise to a height of some 700 feet above that stream.

Strata lie nearly level but with a general northwesterly dip from the head of Big creek to Forked-mouth creek, which, approximately, lies in a syncline, the measures thence rising slightly to Campbell creek and beyond.

From the head of Big creek to the mouth of Forked-

mouth creek, a total air-line distance of ten miles, the fall of strata amounts to about 130 feet, but this dip is not uniform. Along the middle half of Big creek, strata lie nearly level and even a reverse dip is noted, but so slight that it may be only a result of barometric inaccuracy.

The effect of irregularity in the dip is to increase the maximum, but neither in this northwesterly direction nor on the sides, where strata usually dip in the direction the streams run, is there believed to be a dip of more than one per cent. except in a few unimportant local rolls.

A general section for the region follows. This section varies in detail at different places as noted hereafter.

General Section.

Mainly sandstones.

Hindman coal bed, shale roof.

Interval 150 feet, mainly sandstones.

Flag coal bed, sandstone roof.

Interval 60 feet, sandstone at top.

Hazard coal bed, heavy shale roof.

Interval 60 feet, sandstone.

Haddix coal bed, sandstone roof.

Interval 150 feet, sandstone at top.

Hamlin coal bed in shale.

Interval 100 feet, sandstone at bottom.

Fire-clay coal bed, sandstone roof.

Interval 50 feet.

Whitesburg coal bed, sandstone roof.

THE WHITESBURG BED is so split up into thin seams with thick partings as to include, in its few exposures near the river, a thickness of strata of 20 to 30 feet. No attempt was made to measure them all and their intervals, though they are well exposed on Big creek near its mouth. Part or all of them are also well exposed at Hazard on Messer branch.

The interval given of 50 feet up to the Fire-clay coal is regarded as normal and is about the distance from the upper seam of the Whitesburg coal up to the Fire-clay coal. As seen on Brown fork of Big creek the lower 20 feet of this interval is sandstone and the

remainder shales and shaly sandstones; elsewhere in this region the upper half is usually of soft material while in other fields it has been found as a particularly hard sandstone. A seam of coal, apparently an offshoot from the Fire-clay coal, was found along the river 5 to 10 feet below that bed. On Big creek a layer of limestone is found at about this horizon.

THE FIRE-CLAY COAL, which is the coal mined at Hazard and at Lennut below Hazard, is exposed at numerous places scattered over the region between Campbell creek and Big creek. It is of extremely variable section in this region but always with only a very few inches of coal, excepting along the main river and possibly where it goes below drainage, 6 miles up Big creek.

Along the river front are some available working areas, especially favorable in their locations, but the coal is barely thick enough for present mining, and it is altogether probable that that thickness does not hold good far into the hill.

A piece of the flint fire-clay parting from this bed laid on a hard surface and struck sharply with a hammer breaks into many somewhat cuboidal fragments showing no evidence whatever of lamination.

Generally a thick, hard sandstone lies immediately over the Fire-clay coal, and this is especially noted on Willard creek, but on Big creek it is inconspicuous and is largely replaced by shales and shaly sandstones, in which are thin seams of coal and black slate.

Possibly these thin coals and others on Big creek found there to a height of 60 feet above the Fire-clay coal, combine to form the rider to that bed, occasionally workable in other regions, but giving only one sign of its presence in this region other than on Big creek. Where not wholly absent it is certainly valueless.

In two widely separated places fossil limestone was found, probably 50 feet above the Fire-clay coal. From the rider to within 20 to 40 feet of the Haddix coal is here, as usual, a succession of shales and shaly sandstone.

About 100 feet up from the Fire-clay coal is an-

other seam of coal, apparently constant in this as in adjoining regions, always presumably thin, though found at one place on Campbell creek reaching a thickness of 3 feet. Though mined for local use there, the coal is of poor quality. The owner's name, Hamlin, is now applied to this bed.

On Willard creek it was found as a slaty cannel coal 32 inches thick.

Thin ledges of limestone were noted in this series of thin laminated measures at distances of about 180, 160 and 115 feet below the Hazard coal, the first two probably of the same horizon. Occasionally a massive sandstone appears in the top of the series, but not often unless it combines with cliff-making sandstones on the top and directly under the Haddix coal.

This latter rock (under the Haddix coal) is a conspicuous feature of the topography, presenting often cliffs on the hillsides 10 to 30 feet or more in height and with none others near below.

THE HADDIX COAL BED has now but few openings in this region showing thickness, from which it may be inferred that it is generally too thin to work. None whatever were found on Campbell creek and those on Forked-mouth creek have less than $2\frac{1}{2}$ feet of coal. Openings on Willard creek give 3 feet of coal. On Big creek none were found elsewhere than on Curley fork, where the coal runs from 3 to 4 feet thick. The usual excellence of this coal makes it available where coal of poorer quality could not be mined profitably.

Above the Haddix bed, sometimes with a little shale between, is a hard, usually very smooth-faced sandstone 20 feet, more or less, thick.

THE YOUNG COAL BED elsewhere, lies about midway between the Haddix and Hazard beds. At Domino, 3 miles by rail below Hazard, about $3\frac{1}{2}$ feet of coal is opened beside the incline and 55 feet below the mine there opened into the Hazard coal bed, which may belong to this bed but may possibly be the Haddix coal, but in the region under present discussion no sign of this bed was found excepting in one uncertain instance.

The interval between the Hazard and Haddix coal beds is almost wholly of sandstone, appearing frequently in cliffs, the upper half particularly hard, so that in conjunction with the very soft strata above it, it has led to the formation of the principal bench of the hillsides throughout the region.

THE HAZARD COAL, by far the most valuable in this section, lies on this bench, or, not infrequently, where the rock below happened to be less resistant to disintegration, 10 to 15 feet above a subsidiary bench. Towards the head of Willard creek it lies 250 feet above the Fire-clay coal, but this interval increases to 310 feet at points along the river and up Big creek.

No opening into the Hazard coal was found on Campbell creek. On Forked-mouth it runs from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet thick, but in quality the coal is deficient.

On Willard creek above Little Willard the Hazard coal is generally 3 to 4 feet thick, tributaries on the west providing the thicker coal, and it is probably of better quality towards the south. On the lower half of Little Willard the coal is 5 feet thick, but it runs down to less than $3\frac{1}{2}$ feet farther up stream and is there poor in quality.

Along the river above Willard creek the Hazard coal continues about 5 feet thick and in quality appears good. Though near the tops of the hills fronting the river, some good areas are available running up toward the Little Willard-Big creek divide.

On Big creek waters the Hazard coal is of workable thickness throughout excepting at the extreme head, ranging generally from 3 to 5 feet of coal, the latter thickness in extensive areas along the central part of the main creek. The quality here appears equal to that of the coal mined at Domino, which latter is said to find especial favor in the market. A thin seam of bone coal is found here near the bottom of the bed, as is the case at Domino. Some of this coal could be reached through mines on Buffalo creek, above Hazard, but for most of it a railroad up Big creek is needed.

In addition to the broad bench as a means for correlating this bed, it has usually 10 to 12 feet of clay

shale covering, not always visible, almost or wholly devoid of fossils, but containing one or two thin seams of coal, apt to be found near the main bed. Above the shale is another cliff-making sandstone directly upon which is the Flag coal.

THE FLAG COAL shows a gradual increase in thickness from about 2 feet on Campbell creek to 3 to 4 feet on Big creek. While the coal is generally good its height in the hills militates seriously against it. Where the Hazard bed is first mined beneath it, as promises to be the case in its best areas, the bed is likely to be largely ruined.

Close above the Flag bed is another hard sandstone and beyond that others continue, occupying most of the interval to the summits of the highest hills.

THE HINDMAN COAL BED can be found only in the high hills about the heads of Amy Fork of Big creek and thence (if the hills are high enough) to the heads of the main stream. Though difficult of access and with small areas it is not unlikely that some of its thick, probably coking, coal may be utilized.

In giving the detailed description which follows of all the openings visited and other related matter the correlations are in some instances assumed with insufficient data for their determination. The three beds, the Haddix, Hazard and Flag, are variable in all their features and resemble one another very closely in certain places and their proximity combined with their irregular dip and the errors of barometric observation, require for certainty of correlation more development of the beds than now obtains. In all cases of importance, however, the correlations now given are believed to be true.

Altitudes of openings were obtained by aneroid from base levels by the U. S. Geological Survey, heights above tide having been determined at intervals along the streams. Distances given in miles or fractions thereof are approximate, intended only for guidance to openings: Given in yards underground they were estimated only approximately. Thickness of strata given in feet are approximate, but those in inches may be re-

lied upon as correct. Entries having water in them sufficient to prevent going into them are designated as wet entries.

The terms right and left are used in describing locations always with the observer supposed to be looking up stream.

CAMPBELL CREEK.

The railroad station Krypton (Post Office, Glenn) is at the mouth of this creek, and at altitude 805. The mouth of the creek is about 785.

On the left, $\frac{1}{4}$ mile up the creek, Clark Campbell has an entry into the Fire-clay coal bed, not visited, said to have about the same section as in the entries on the river just above Krypton. This entry is now in operation while the latter are not. Exposures of the bed farther up the creek show it worthless there.

LEFT FORK.

On the left, $\frac{3}{4}$ mile up: Altitude of mouth, 850.

In a rockhouse on the right, $\frac{3}{8}$ mile up this fork, the Fire-clay coal, 5 feet above drainage has the following section:

Fire-clay Coal Bed.

Sandstone	20 ft.
Coal	6"
Flint fire-clay	3"
Coal	10"
Altitude, 920.	

In the road above the rockhouse the stain of the Hamlin coal shows at altitude 1,010.

On the right, $\frac{1}{2}$ mile up, Joseph Hamlin has a ten-yard entry into this bed, 10 feet above the fork, giving at its face the following:

Hamlin Coal Bed.

Massive sandstone	5 ft.
Coal	12"
Slaty coal	18"
Black slate and coal..	3"
Coal	4"
Altitude, 995.	

While the whole bed section is mined and burned locally, its quality is not such as would find favor in open market.

Two entries on the left, $\frac{5}{8}$ mile up, show a foot of the same good coal at the top and 21 inches of slaty coal next below, with the remainder of the section covered.

A mile up the Left fork a prominent cliff has its top at altitude 1,165. Allowing for dip up stream, this is nearly 300 feet above the Fire-clay coal and consequently the place for the Hazard coal bed. A bench, probably of the Flag coal, is 80 feet higher.

On the left, $1\frac{1}{2}$ miles up, directly on the sandstone of the cliff just noted, a five-yard wet entry, 30 feet above the fork gives, at its mouth, some $3\frac{1}{2}$ feet of coal of the Hazard bed, under 10 feet of shale. In the shale is 2 inches of coal 3 feet above the main bed: Its altitude is 1,155.

On a right branch, 1 mile up Campbell creek, on the left, $\frac{3}{8}$ mile up the branch and 275 feet above its mouth, James Hamlin has a twelve-yard entry into the Haddix bed, under 3 feet of shale, giving 26 inches of clean coal at the face and having 2 inches or more of black-jack floor. It lies directly on a prominent cliff (as seen across the branch), and at altitude 1,160, is about 235 feet above the Fire-clay coal.

On a left branch, $1\frac{1}{4}$ miles up the creek, on the right, $\frac{1}{4}$ mile up the branch and 230 feet above its mouth, Nancy Eversole has an eight-yard entry into the Haddix bed, under 3 feet of shale, giving 32 inches of coal at the face. It is 5 feet above the top of a cliff and at altitude 1,140.

On the right of the main creek, $1\frac{1}{4}$ miles up it, just above the last mentioned branch, the following section is exposed at creek level:

Fire-clay Coal Bed.

Sandstone	20 ft.
Coal	12"
Shale	5 to 10 ft.
Red flint fire-clay.....	3"
Shale	8"
Coal	0 to 3"
Fire-clay	0 to 1 ft.
Laminated sandstone.	
Altitude, 915.	

While this variable section is in marked contrast to that on the Left fork and along the river above Campbell creek, and the red color of the fire-clay parting is most unusual, there can be no doubt of the identity of the bed.

RIGHT BRANCH.

One and three-fourth miles up Campbell creek: Altitude of mouth, 955.

On the right of the branch, $\frac{1}{4}$ and $\frac{3}{8}$ miles up it are an abandoned entry and prospect on top of a cliff rock into what appears to be the Hazard bed at altitudes 1,175 and 1,155 respectively.

The branch forks $\frac{1}{2}$ mile up it and on the right of the left fork near its mouth Henry Campbell has an opening with the following section:

Flag Coal.

Shale	2 ft.
Coal	7"
Shale	7"
Coal	5"
Shale	6"
Coal	14"
Altitude, 1290.	

The correspondence of this with the next opening following enables correlation. The altitudes given for openings on this branch are not altogether reliable.

A thin coal showing in the road on the left 2 miles up the creek is of the Hamlin bed. It is about at creek level, at the forks, $2\frac{1}{4}$ miles up the creek.

RIGHT FORK.

On the right, $2\frac{1}{4}$ miles up: Altitude of mouth, 1,005.

In a left hollow at the mouth of this fork, on the right at its head, $\frac{1}{8}$ mile up, William Huff has a ten-yard entry with the following section, at its face:

Flag Coal.

Shale	3 ft.
Coal	11"
Shale	1"
Coal	4"
Shale	3"
Coal	15"
Altitude, 1260.	

The top of the cliff over the Haddix coal shows at altitude about 1,180.

LEFT FORK.

On the left, $2\frac{1}{4}$ miles up: Altitude of mouth, 1,005.

On the right of this fork, at its head a half-mile up, about level with the gap through which the road to Hyden passes, William Huff has a long entry with the following section, 6 yards in:

Flag Coal.

Shale	3 ft.
Coal	12"
Shale	4"
Coal	16"
Altitude, 1280.	

The cliff under the Haddix coal appears here to be most prominent with its top at altitude above 1,160.

The area of the Flag coal about the heads of the creek is small, but, if good thickness of the beds below it can be found to induce railroad construction up this creek, sufficient area for working this one is also available. So far as development of these beds has gone, however, the prospect is not encouraging.

On the right of the river, $\frac{1}{2}$ to $\frac{3}{8}$ mile above Campbell creek, Clark Eversole has three entries into the Fire-clay coal from which some coal has been shipped by rail, but they are all abandoned now. They give the following sections:

Fire-clay Coal.

	At mouth.	10 yards in.	20 yards in.
Coal	28"	27"	28"
Parting	6"	6"	6"
Coal	11"	8"	4"

Altitude, 890.

The parting in the first two entries is wholly flint fire-clay, but in the third the upper half is more like a bone coal.

On the left of a right hollow, $\frac{3}{4}$ mile above Krypton, $\frac{1}{8}$ mile up the hollow, Lizzie Napier has a ten-yard entry into the same bed with the following section:

Fire-clay Coal.

Sandstone.	
Coal	28"
Flint fire-clay	5"
Coal	11"
Altitude, 890.	

BIG MEADOW (OLIVER) BRANCH.

On the right of the river, $1\frac{1}{4}$ miles above Krypton: Altitude of mouth, 790.

On the right of the branch, $\frac{1}{4}$ mile up, Jarrett Feltner has a ten-yard entry with the following section 2 yards in:

Fire-clay Coal.

Sandstone.	
Coal	26"
Flint fire-clay	5"
Coal	9"
Altitude, 885.	

A half-mile up the branch, 5 feet above it, John Jackson has two long entries with the following section at their mouths:

Fire-clay Coal.

	On Left.	On Right.
Sandstone	25 ft.	
Coal	19"	24"
Parting	6"	7"
Coal	12"	12"
Altitude, 875.		

The upper half of the parting is here black-jack the lower half flint fire-clay.

On the right, $1\frac{1}{2}$ miles above Krypton, William G. Napier has a six-yard entry with the following section 1 yard in:

Fire-clay Coal.

Sandstone.	
Coal	23"
Black slate	3"
Flint fire-clay	3"
Coal—not measured.	
Altitude, 885.	

LITTLE MEADOW BRANCH.

On the right, 2 miles above Krypton: Altitude of mouth, 795.

On the right of the branch, $\frac{1}{8}$ mile up it, John Duff has a twelve-yard entry with section as follows, taken at its mouth:

Fire-clay Coal.

Sandstone.	
Coal	22"
Bone coal	2"
Flint fire-clay	3"
Coal	7"
Altitude, 880.	

The bed goes below drainage, $\frac{1}{4}$ mile up, with 24 inches of top coal.

A mile up the branch to a right branch, and on the left $\frac{1}{4}$ mile up the latter, Garrard Campbell has a six-yard wet entry into the Flag bed, under 10 feet of sandy shale. It has probably about 3 feet of coal and is at

altitude 1,270. The bed has in this river hill but 50 to 75 feet of covering and nowhere in the vicinity appears to have a workable area. The gap between the two Meadow branches is at altitude 1,035, level with the top of the cliff below the Haddix bed, apparently, though some 50 feet lower than was to be expected.

The following sections were taken along the railroad track between the mouth of Little Meadow branch and the Campbell river-bend.

Fire-clay Coal.

Miles from Krypton	2½	2½	2¾
Coal	32"	26"	24"
Flint fire-clay	6"	5"	4"
Coal	11"	7"	8"
Altitude	865	855	870

All have sandstone roof. The first was measured at the face of a ten-yard entry, the others, 100 yards respectively, below and above the Campbell bend tunnel, at the mouths of long entries made for use only during railroad construction apparently.

On the right of the river (facing up stream) Joseph Campbell, John Colwell and Green B. Campbell have 5 to ten-yard entries at 2½, 2¼, and 1¾ miles below Yerkes, respectively, the latter 30 feet above the railroad at mile-post "L 126." The first one shows 15 feet of shaly sandstone under it and all are covered by 20 feet of massive sandstone. Their bed sections follow:

Fire-clay Coal.

	(1)	(2)	(3)
Coal	12"		
Shale	1"		
Coal	14"	27"	26 to 28"
Flint fire-clay	5"	4"	5"
Coal	9"	12"	10"
Altitude	865	855	855

In the second section 3 inches of the coal, 6 inches from the bottom, is bony.

CARY BRANCH.

On the right of the river, $1\frac{1}{4}$ miles below Yerkes: Altitude of mouth, 800.

The uniformity of the Fire-clay coal shown above is not continued to this branch.

On the right near its mouth a foot of coal shows in the road at altitude 865, with 15 feet of shale over it to the Fire-clay coal at altitude 880. The bed here, as exposed in the road, has, under sandstone, only 12 inches of coal, with 3 inches of flint fire-clay parting in the middle.

On the right of the branch, at its head, $\frac{5}{8}$ mile up, Cary Couch has a short entry into the Flag bed, at altitude 1,265, having 26 inches of fine-looking coal under shaly sandstone, and with 6 inches of black slate floor. Prospecting for lower beds is said to have resulted in finding no coal thicker than 18 inches (of the Hazard or Haddix bed.)

FORKED-MOUTH CREEK.

The railroad station Yerkes is at the mouth of this creek, which is at altitude 795.

On the left, $\frac{3}{8}$ mile up (below Laurel fork), the following section is exposed from the creek level up:

Fire-clay Coal.

Shaly sandstone	10 ft.
Black slate	2"
Flint fire-clay	4"
Coal	10"
Fire-clay and shale....	8 ft.
Coal	7"
Shaly sandstone	15 ft.
Altitude, 855.	

LAUREL FORK.

On the right of a left branch, $\frac{3}{8}$ mile up the fork, $\frac{1}{4}$ mile up the branch, C. E. Gray has a four-yard entry with bed section at its face as shown following:

Flag Coal.

Sandstone	3 ft.
Shale	8"
Coal	8"
Shale	4"
Coal	17"
Altitude, 1190.	

On the right of a left branch, $\frac{3}{4}$ mile up the fork, $\frac{1}{8}$ mile up the branch, Aaron Brock has a one-yard entry into the Haddix bed, giving, under 2 feet of shale, 28 inches of coal, at altitude 1,080. The shale has much mica, is soft and sandy, evidently a weathering of sandstone to shale.

In the fork, $1\frac{1}{2}$ miles up it, James Campbell has opened the same bed with the following section:

Haddix Coal.

Soft, friable sandstone.	
Block coal	8"
Splint coal	15"
Block coal	4"
Altitude, 1090.	

COLWELL FORK.

On the right, $\frac{1}{2}$ mile up Forked-mouth creek: Altitude of mouth, 855.

On the right, in the road near the mouth of the fork, the stain of the rider to the Fire-clay coal is visible, above a massive sandstone, at altitude 865. As the sandstone is 25 feet or more thick, the Fire-clay coal is probably slightly under the mouth of the fork.

On the left of a right branch, $\frac{1}{4}$ mile up the fork and also up the branch, Elijah McIntosh has a fifteen-yard entry into the Flag bed, at altitude 1,200, having at its face 34 inches of coal, with 2 inches of shale parting 22 inches from the bottom, as measured at the face where the roof is a fossiliferous shale. At the mouth of the entry 5 feet of massive sandstone lies on the coal.

In the next branch above on the road to this entry the top of the cliff under the Hazard bed is at altitude 1,125.

At the head of a right branch, $\frac{5}{8}$ mile up the fork, $\frac{1}{8}$ mile up the branch, J. M. Colwell has a four-yard entry with the following bed section at its face:

Flag Coal.

Shale	10 ft.
Coal	12"
Shale	5"
Coal	18"
Altitude, 1210.	

As with the preceding entry a cliff under the Hazard bed is 60 feet under this one and the stain of the Haddix coal shows in the road below at altitude 1,100. This is the only place known where the Flag coal has such a covering of shale over it, a common occurrence with the Hazard bed. But the similarity of bed sections here and in the entries on the branch below this just given, and at Mr. Gray's on Laurel fork, together with their height of 350 feet or more above the Fire-clay coal are regarded as proof positive of the correlation.

On the right of the next branch, $\frac{3}{4}$ mile up the fork, $\frac{1}{4}$ mile up the branch, a closed entry, under 10 feet of shale, gives what is probably the Hazard bed at altitude 1,185 as obtained, but actually probably 25 to 30 feet less.

On the right of a right branch, 1 mile up the fork, $\frac{1}{8}$ mile up the branch, below the road as it ascends the hill, Martha Colwell has an incomplete opening, from which the following section was obtained:

Hazard Coal.

Shale	8 ft.
Block coal	14"
Splint coal	18'
Block coal	10"
Altitude, 1160.	

Six inches more coal was reported underneath, but was not accessible when visited.

The likeness of this bed section to that of the Had-dix coal at the head of Laurel fork is almost sufficient for correlation, but the conformity in roof and in altitude with the entry near the head of the left fork of Campbell creek force the conclusion that this is of the Hazard bed. A large area of coal is available here.

Seven-eighths mile up the creek, on the left, $\frac{1}{8}$ mile up a right branch there, the Tennis Coal Company has started an entry into the Hazard coal at altitude 1,175, 35 inches thick at the face, 1 yard in. A seam one foot from the top marks the place of change from block to splint coal which occurs near the head of Colwell fork. A foot of sandstone shows on top of the coal. About 60 feet higher is a 20-foot cliff which caps the ridge.

IVY GAP FORK.

On the right, 1 mile up: Altitude of mouth, 885.

On the right of a right hollow, $\frac{3}{4}$ mile up the fork, $\frac{1}{8}$ mile up the hollow, James Baker has a five-yard entry into the Flag coal at altitude 1,310, having under 5 feet of sandstone, 27 inches of coal, including 2 to 4 inches of black slate or bone coal 2 inches from the bottom. The top of a 15-foot cliff is 60 feet below it—altitude 1,250.

On the right, at the mouth of the next right hollow, $\frac{7}{8}$ mile up the fork, William Baker has a one-yard entry into the Hazard bed, at altitude 1,250. Over the 30 inches of good-looking block coal is 8 feet of shale, on top of which appears a thin coal stain, and just below it is a cliff of the same sandstone as the cliff of the preceding hollow.

On the left of a left branch, $1\frac{1}{8}$ miles up the fork, $\frac{1}{8}$ mile up the branch, John Duff has a covered prospect reported of bed section as follows:

Hazard Coal.

Shaly sandstone	3 ft.
Coal	12"
Black slate	4"
Coal	14"
Altitude, 1260.	

This "black slate" corresponds with the splint coal of the same bed on Colwell fork.

On the right of the main creek, $2\frac{1}{2}$ miles up it, Stephen Stedham has a covered prospect into the Had-dix bed at altitude 1,160, 80 feet above the creek.

Above this opening is an eight-yard entry, under 3 feet of sandstone, into the Hazard bed with 27 inches of coal at its face, at altitude 1,220. The lower half of the coal appears slaty and bony.

Across the creek, on the left, $\frac{1}{8}$ mile up a left branch, Hanson Colwell has a twelve-yard entry into the Hazard bed at altitude 1,240, with 36 inches of coal at its face. The lower foot or more of the coal looks like dull splint or bony coal like that across the creek, but is reported to burn well. Two feet of massive sandstone cover the bed and 10 feet higher is a 15-foot cliff. Cliffs also show close under each coal bed.

On the right, 3 miles up the creek, Thomas Sizemore has a long entry into the Hazard bed, under sandstone, with 27 inches of coal at its mouth similar to the preceding: Its altitude is 1,225.

In the railroad cut at Yerkes 6 inches of coal at altitude 830, 3 feet above the track and under 25 feet of shale is an off-shoot from and below the Fire-clay coal noted at openings below Yerkes.

On a right branch, $\frac{1}{4}$ mile above Yerkes, on the right (of the right fork), $\frac{1}{8}$ mile up, William Campbell has a twelve-yard entry into the Flag bed at altitude 1,235, having 32 inches of coal at its face, largely fine-looking splint, under two feet of shale and then sandstone. It lies directly on a 20-foot cliff.

On the left (of the left fork), $\frac{3}{8}$ mile from the river, C. A. Baker has a long entry with the following section at its mouth:

Flag Coal.

Shaly sandstone	5 ft.
Block coal	9"
Splint coal	15"
Block coal	8"
Altitude, 1210.	

This entry also is on a cliff and another cliff lies about 80 feet higher. The succession of cliffs show at different heights of the hills along the river as conspicuous escarpments.

WILLARD CREEK.

Altitude of mouth, 800.

On the left, $\frac{1}{4}$ mile up the creek, 5 feet above the road, two seams, probably the upper ones of the Whitesburg bed appear, between a parting of fossiliferous shale as shown following in conjunction with the Fire-clay coal as found nearly above this exposure and given in an earlier report.

Fire-clay Coal.

Sandstone	5 ft.
Shale	5 ft.
Coal	2"
Flint fire-clay	4"
Coal	10"
Clay	4"
Black slate	3"
Clay.	
Altitude, 870.	

Whitesburg Coal (in part).

Shaly sandstone	5 ft.
Black slate	3 ft
Coal	9"
Shale	5 ft.
Coal	8"
Altitude, 830.	

Above these exposures is a prominent cliff with its top at altitude 1,105.

Twenty-five feet higher is an old prospect into what may be either the Haddix or the Young bed; at altitude 1,130, it is 260 feet above the Fire-clay coal.

LITTLE WILLARD CREEK.

On the left, $\frac{1}{4}$ mile up: Altitude of mouth, 810.

On the left, $\frac{1}{4}$ mile up this creek, is a long entry into the Hazard coal under 4 feet of shale exposed. Now abandoned, it still shows about 5 feet of coal at altitude 1,185. Being in the peak of a ridge, its area here is probably not over 10 acres.

The durability of the sandstone over the Fire-clay coal in this vicinity is shown not only in the cliffs on either side, but also by the fact that the creek has failed to cut through it until below the mouth of Fugate fork, although its drainage area above is considerable and the descent of the stream sufficient to give it much cutting power.

FUGATE FORK.—On the left of Little Willard creek, $\frac{3}{4}$ mile up it: Altitude of mouth, 950.

On the left, $\frac{3}{8}$ mile up, William McIntosh has a now abandoned entry in which a former measurement gave the following:

Hazard Coal.

Shale	2 ft.
Thin coal.	
Shale	10 ft.
Coal	6"
Splint coal	24"
Coal	10"
Bony coal	12"
Coal	5"
Altitude, 1180.	

The twelve inches of bony coal appears to be fairly good and the whole should be marketable.

On the left, at the mouth of a right hollow, $\frac{1}{2}$ mile up Fugate fork, James Colwell has a four-yard entry into the Hazard bed at altitude 1,185 with 65 inches of coal at its face, the lower 16 inches somewhat bony. Five

feet of shale lies on the coal, with a thin coal stain showing in the middle of it.

On the left, $\frac{5}{8}$ mile up, an old stripping of the Haddix bed, long since covered, was reported to have 3 feet of coal, the upper 2 inches cannel; it is at altitude 1,120.

On the left of a right hollow, $\frac{3}{4}$ mile up, $\frac{1}{8}$ mile up the hollow, Jack Fugate has a ten-yard entry into the Hazard bed, at altitude 1,205, with 62 inches of coal at its face and 5 feet of shale above it. The coal of the lower 10 inches is slightly bony, but apparently not enough so to affect its sale. It is not a rich-looking coal but has some good splint in it.

The hills in these right branches are higher than on the left and give the Hazard bed 100 to 200 feet of covering and a considerable area, which might be attacked from the river opposite the head of this fork.

On the left of Little Willard creek, $\frac{7}{8}$ mile up it, Henry Fields has a wet entry with the following section at its mouth.

Hazard Coal.

Earth.

Coal or shale	2 ft.
Shale	1½ ft.
Coal	½ ft.
Shale	5 ft
Coal	57"
Bone coal	4"
Coal	6"

Altitude, 1205.

The upper foot of the 57 inches seems to be poor. The two feet of coal and shale at the top is probably a slip from the Flag bed.

On the right, a mile up, an old prospect into the Haddix coal, 10 feet above a cliff, gives the altitude of the bed as 1,165.

On the left of a left branch, $1\frac{1}{8}$ miles up, $\frac{1}{8}$ mile up the branch, G. C. Morgan has a five-yard entry of the following bed section half way in:

Hazard Coal.

Sandstone	2 ft.
Shale	1 ft.
Coal	9"
Shale with coal	6"
Coal	19"
Black slate	6"
Altitude, 1235.	

A streak of bony or slaty coal was found 5 to 8 inches above the black slate.

On the right, $1\frac{1}{4}$ miles up, John W. Morgan has an abandoned entry into the Hazard coal said to be 5 feet thick with the lower foot slaty. Its altitude, 215 feet above the creek, is 1,210.

On the left of a right branch at Mr. Morgan's, $1\frac{1}{4}$ miles up, $\frac{1}{8}$ mile up the branch, he has a three-yard entry into the Haddix coal at altitude 1,160. The bed is 42 inches thick here and includes 4 inches of cannel slate 2 inches from the top, leaving an even 3 feet of coal workable. A prominent cliff lies close below it.

On the right of a left branch, 2 miles up, $\frac{1}{8}$ mile up the branch, William Jamieson has a wet entry into the Hazard bed with 64 inches of coal at its mouth, reported of inferior quality: Its altitude is 1,215.

On the left, $2\frac{1}{2}$ miles up, William Fields has an eight-yard entry into the Hazard coal at altitude 1,235, apparently in a roll, the coal thinning at face and irregular, approximately $2\frac{1}{2}$ feet thick.

Along a branch on the right, $\frac{7}{8}$ mile up main Willard creek, the following section was obtained in going from the mouth of the branch to a high peak, a half-mile in a nearly straight direction:

High peak	1,240
Base of 25-foot cliff	1,160
Base of 20 feet exposed sandstone.....	1,090
Haddix entry	1,070
Base of 15-foot cliff	1,005
Base of 40-foot cliff	850
Probable place of Fire-clay coal.....	845
Mouth of branch	835

From the summit the upper cliff can be seen as a ridge cap rock at intervals in various directions.

The above Haddix entry, belonging to Ellis Willis, is on the right of the branch, $\frac{1}{4}$ mile up and has 34 inches of clean coal at its mouth increased to 38 inches at its face, 10 yards in. It is covered by 5 feet of massive sandstone.

HURRICANE FORK.

On the left, $1\frac{1}{4}$ miles up: Altitude of mouth, 845.

The Fire-clay coal here is probably at altitude about 850, slightly lower than at the mouth of the creek, but from here up stream a decided rise of strata is noted.

From this point also a reduction is found in the interval between the Fire-clay and the Hazard coals from about 300 feet to some 250 feet a mile above, the reduction being indicated on both forks.

In a left hollow at the mouth of Hurricane fork, on the right, $\frac{1}{8}$ mile up, E. W. Fields has a long entry into the Hazard coal, 40 inches thick, with a knife-edge parting 2 inches from the top, as measured at the mouth of the entry. Eight feet of shale are above it. Its altitude is 1,145.

BRIER-PATCH (STACY) BRANCH.—On the left, $\frac{1}{2}$ mile up Hurricane fork: Altitude of mouth, 875.

On the right of this branch at its mouth is the following exposure:

Fire-clay Coal.

Laminated sandstone	5 ft.
Black slate.	.....
Black flint fire-clay	 4"
Coal	 8"
Shale (to branch)	10 ft.
Altitude,	895.

In a left branch, $\frac{1}{4}$ mile up, the Fire-clay coal shows again, at altitude 900.

On the left of this little branch, $\frac{1}{4}$ mile up it, Mack Morgan has a six-yard wet entry into the Hazard bed

showing at the mouth about 36 inches of coal, under 2 feet of shale, at altitude 1,170.

On the right, $\frac{1}{4}$ mile up a left branch, $\frac{1}{2}$ mile up Brier-Patch branch, H. P. Morgan has a wet entry into the Hazard bed at altitude 1,165. Apparently the coal is $3\frac{1}{2}$ to 4 feet thick, but only about $1\frac{1}{2}$ feet was visible. In the dump the coal looked rather poor. The bed has $1\frac{1}{2}$ feet of black slate and coal covering, above which is sandstone.

In the fork at William Standiford's, $\frac{7}{8}$ mile up Hurricane fork a limestone is exposed at altitude 950, some 50 feet above the Fire-clay coal.

On the left at this place is a fifteen-yard entry with the following section at its face:

Hazard Coal.

Shale	8 ft.
Coal	3"
Black slate	4"
Coal	35"
Slaty coal	9"
Altitude, 1155.	

Though well under cover the coal is soft and muddy. The bench of the Haddix coal is very evident 65 feet lower.

On the left, $1\frac{3}{4}$ miles up, Felix Stacy has an eight-yard entry with the following section at its mouth:

Hazard Coal.

Shale	8 ft.
Coal	2"
Clay	1"
Coal	2"
Cannel slate	8"
Coal	37"
Altitude, 1185.	

It is but 40 feet above the branch and a good area is available, but the quality of the coal is doubtful.

Coal taken from Hurricane fork, $\frac{5}{8}$ mile up it, said to be 6 inches thick, is of the Fire-clay coal bed at altitude 890.

A former report gives the following as 120 feet above the Fire-clay coal in this vicinity, with no allowance made for inclination of strata. It is evidently the Hamlin coal of Campbell creek, there found 90 feet above the Fire-clay coal:

Hamlin Coal.

Clay.	
Iron ore	4"
Shale	3"
Coal	5"
Shale	18"
Cannel coal	23"
Clay.	
Altitude, 1010 (?)	

The cannel was described as rather slaty.

On the right, 1 mile up, Samuel Colwell has two entries, one closed and the other 8 yards in, giving the following bed section at its mouth:

Hazard Coal.

Sandstone.	
Shale	4 ft.
Cannel slate	2"
Coal	43"
Altitude, 1180.	

FRIER-CAMP BRANCH.—On the left, $1\frac{1}{4}$ miles up Hurricane fork.

On the left, $\frac{1}{2}$ mile up the branch, 20 feet above it the Hamlin coal bed, about 100 feet above the Fire-clay coal, gives the following section, the lower 6 inches not seen:

Hamlin Coal.

Shaly standstone	5 ft.
Coal	2"
Shale	$1\frac{1}{2}$ ft.
Coal	14"
Altitude, 1040.	

On the right, $1\frac{1}{4}$ miles up, Samuel Colwell has a six-yard entry with the following bed section at its face:

Hazard Coal.

Sandstone	5 ft.
Shale	5 ft.
Coal	1"
Shale and coal	18"
Coal	6"
Shale	1"
Cannel slate	5"
Coal	38"
Altitude, 1225.	

The entry is not yet carried to solid coal. Though low in the hill here near the head of the branch, the area of coal in this vicinity is small as the hills are low.

A former opening at the head of Hurricane fork, "a mile above Samuel Whittaker's" (now Samuel Colwell), gave the following section and analysis by Dr. R. Peter from my sample:

Hazard Coal.

Cannel slate	6"
Clay	6"
Cannel slate	9"
Shale	3"
Coal	45"
Altitude, 1190.	

Analysis.

Lab. No. 2794.

Moisture	3.96
Volatile combustible matter	32.84
Fixed carbon	52.80
Ash (purplish gray)	10.40
	100.00
Sulphur	0.722
Specific gravity	1.390
Coke	friable.

"Portions of the sample dull splint coal. Some fibrous coal between the laminae, but no apparent pyrites. Some pieces bright pitch black." The sample was taken from a surface opening and consequently the

analysis is too high in ash, but in view of the character of the coal down the creek it may be assumed that the discrepancy is not great.

On a bench 185 feet above this last opening, at altitude 1,375, a thick coal bed was reported, probably correctly, as it corresponds nearly with the height of the Hindman bed opened little more than a mile to the south on Amy fork of Big creek.

On the left, 2 miles up Willard creek, 100 yards above the school house, is exposed the following section 5 feet above the creek:

Fire-clay Coal.

Sandstone.	
Coal	3"
Sandstone	1"
Black slate	12"
Flint fire-clay	7"
Coal	8"
Altitude, 895.	

On the right $2\frac{3}{8}$ miles up, Jerry Combs has a wet entry, having at its mouth 40 inches of coal on 6 inches of black slate containing coal and under 6 feet of shale. Floor and roof are indicative of the Hazard bed, although, at altitude 1,150, the opening is but about 240 feet above the Fire-clay coal bed.

BIG BEECH FORK.

On the left, $2\frac{1}{2}$ miles up Willard creek: Altitude of mouth, 920.

On the right at the mouth of this fork is the following exposure:

Fire-clay Coal.

Sandstone	10 ft.
Black slate	8"
Flint fire-clay	9"
Coal	5"
Black-jack	3"
Fire-clay	9"
Black-jack	3"
Shale	1 ft.
Altitude, 920.	

In this and in the preceding section of the same bed there is some variation in thickness of strata in each exposure.

ROAD FORK.—On the right, $\frac{1}{4}$ mile up Big Beech fork: Altitude of mouth, 945.

On the right, $\frac{1}{2}$ mile up Road Fork, Samuel Campbell has a twelve-yard entry with the following bed section at its face:

Hazard Coal.

Shaly sandstone	3 ft.
Shale with coal	1½ ft.
Black slate	5"
Shale	1½ ft.
Cannel slate	2"
Coal	10"
Shale	1"
Coal	20"
Bone coal	5"
Coal	5"
Black slate	1 or 2"
Altitude, 1160.	

On the left, $1\frac{1}{8}$ miles up, what appears to be the Fire-clay coal rider has the section following, the shale roof including, on or near the coal, a band of black slate:

Fire-clay Coal Rider (?).

Sandstone	4 ft.
Shale	7 ft.
Coal	3"
Shale	8"
Coal	3"
Shale	1"
Coal	5"
Altitude, 1015.	

Two such seams of coal occur with others on Whitaker branch of Big creek, about 60 feet over the Fire-clay coal. The interval to that coal here is probably not more than half of that.

On the left and left of the road and by it, $1\frac{1}{2}$ miles up, is an old prospect into the Haddix coal, at altitude 1,185.

On the right of the gap at the head of the fork, $1\frac{3}{4}$ miles up, John Hoskins has an eight-yard entry into the Flag coal. It contains 31 inches of good block and splint coal under shale roof, with sandstone close above, and is at altitude 1,335. With the gap only 20 feet higher and adjacent hills not much higher than that, the area of the coal is small.

LITTLE BEECH FORK.—On the left, $\frac{3}{8}$ mile up Big Beech fork.

On the right, $\frac{1}{8}$ mile up Little Beech fork, Elijah Hoskins has a twelve-yard entry, with the following bed section, taken 3 yards in:

Hazard Coal.

Shale with thin coals	7 ft.
Black slate	7"
Shale	6"
Coal	42"
Altitude,	1145.

This coal looks finely in the dump, but in the entry the upper part of it seems rather poor. It lies on a big bench and has a long, but narrow area.

In Big Beech fork, $\frac{7}{8}$ mile up, is about 6 inches of limestone, at altitude 975, about 60 feet above the Fire-clay coal.

On the right, $1\frac{1}{8}$ miles up, Abijah Hoskins has a ten-yard wet entry with the following section, the coal as reported, probably correctly:

Hazard Coal.

Shale with coal and	
black slate	3 ft.
Black slate	5"
Shale	2½ ft.
Coal	38"
Altitude,	1160.

BUBBY ROOT BRANCH.

On the right of Willard Creek, 3 miles up: Altitude of mouth, 955.

On the left of the branch, $\frac{1}{8}$ mile up, an old prospect into the Hazard coal, under 8 feet of shale, still

shows $1\frac{1}{2}$ feet of coal, which may be double that thickness or more. Its altitude is 1,155, some 15 feet higher than the cliff across the branch.

On the right of a left branch, at its mouth, $4\frac{1}{2}$ miles up the creek, Harris Couch has a five-yard entry, with bed section as follows:

Hazard Coal.

Shale	8 ft.
Coal	13"
Shale	11"
Coal	24"

Altitude, 1185.

This entry is 15 feet above a prominent cliff.

On the right of a right branch, $4\frac{1}{2}$ miles up the creek, $\frac{1}{4}$ mile up the branch, Andrew Stedham has an eight-yard entry into what is probably the Flag bed, with 32 inches of coal at its face and 4 feet of sandstone over it. Its altitude is 1,235.

On the left of the same branch, opposite the preceding, Frank Campbell has an eight-yard entry into the same bed with sandstone roof and 38 inches of coal at its face. Its altitude is 1,225.

Considerable prospecting seems to have been done in this neighborhood in order to get coal for local use, but so far as learned all openings excepting those given were abandoned.

On the right of the river, $\frac{1}{2}$ mile above Willard creek, $1\frac{1}{2}$ miles above Yerkes, Benjamin Fugate has a two-yard entry with the following section, not uniform:

Fire-clay Coal.

Sandstone	4 ft.
Shale	1 ft.
Sandstone	4"
Shale	3"
Coal	3"
Flint fire-clay	3"
Coal	9"
Shale	3"
Coal	3"
Shale	12"
Coal	4"

Altitude, 875.

Between this bed and the Whitesburg coal, about 45 feet lower, there appears to be only shaly sandstone.

On the right, $1\frac{3}{4}$ miles above Yerkes, Mr. Fugate has a twelve-yard entry, with 57 inches of coal at its mouth, the lower 10 inches slightly slaty, and with 2 inches of bone in the middle. Eight feet of shale with a coal stain on top overlie the coal, which is of the Hazard bed, at altitude 1,190. A cliff below the entry with its top at altitude 1,125 underlies the Haddix coal.

On the left of a right branch, about $4\frac{3}{4}$ miles above Yerkes, $1\frac{3}{8}$ miles below Typo, $\frac{1}{4}$ mile up the branch, Moses Felton has a long entry, under 5 feet of shale, with 60 inches of coal 5 yards in. This is of the Hazard bed, at altitude 1,175.

On the right of the river (looking up it) $\frac{7}{8}$ mile below Typo, Walter Couch has a fifteen yard entry into the Hazard bed, at altitude 1,185, having 58 inches of coal, measured 4 yards in, under 10 feet of shale, with 5 inches of coal in the middle of the shale.

The cliff under the Haddix coal shows prominently here with its top at altitude 1,120.

BEN COUCH BRANCH.

On the right of the river, $\frac{5}{8}$ mile below Typo.

On the left, $\frac{1}{2}$ mile up the branch, a two-yard entry gives the following:

Haddix Coal.

Sandstone	4 ft.
Coal	1"
Cannel slate	1"
Coal	26"
Altitude, 1140.	

The coal, excellent in appearance, is largely splint coal.

At the face of a twenty-yard entry above the preceding, under 8 feet of shale, the Hazard bed gives 58 inches of coal at altitude 1,190.

While these two beds barely cut or overreach the tops of the hills immediately against the river, there is good area for mining here on both sides of the branch.

BIG CREEK.

Altitude of mouth, 810.

Several thin seams of the Whitesburg coal show in shaly sandstone and shale cliffs on the left, to a height of some 30 feet above the river for the first $\frac{1}{4}$ mile up the creek. Similar to the exposures on Messer branch, opposite Hazard, they were not examined in detail.

On the right, $\frac{1}{2}$ mile up the creek, a bench at altitude 1,000 seems to indicate the place of the Hamlin coal bed 100 feet above the Fire-clay coal. At altitude 1,140, the top of a 40-foot cliff is the place of the Haddix coal, while at altitude 1,190, near the top of the hill, is an old entry, now closed, into the Hazard bed on top of a 20-foot cliff, under which may possibly be the Young bed.

BROWN FORK.

On the left, $\frac{3}{4}$ mile up Big creek: Altitude of mouth, 935.

In the fork, $\frac{3}{8}$ mile up, is a thin seam of the Whitesburg coal, while on the right, 10 feet higher, at altitude 855, the upper seam of the bed is exposed with 10 inches of coal under 2 feet of black slate, with shale above and below.

On the left, by the road, $\frac{3}{4}$ mile up the fork, a foot of coal slipped from the Fire-clay coal bed lies on a foot of black slate, at altitude 905. Below this are 30 feet of shales and then 20 feet of sandstone to the fork.

CURLEY FORK.—On the left, 1 mile up Brown Fork: Altitude of mouth, 860.

On the left, $\frac{3}{8}$ mile up, by the road, part or all of the Fire-clay coal bed is exposed with coal 8 inches thick under 4 feet of black slate and upon 5 feet of common fire-clay, at altitude 945.

The stain of the Haddix coal shows in the road, on

the left, $1\frac{1}{8}$ miles up, at altitude 1,190, 5 feet above a 20-foot cliff.

From that stain to two entries into the Hazard bed, above the road, $1\frac{1}{8}$ and $1\frac{1}{4}$ miles up, strata appear to be mostly sandstone. Of these two entries, belonging to William Combs, the latter, under 20 feet of sandstone, has, at its face, 30 yards in, 54 inches of excellent coal, excepting 3 inches a foot from the bottom, which is bone coal, apparently detracting little from the value of the whole. The altitude is 1,255.

On the left, by the road, $1\frac{1}{2}$ miles up, an old prospect developed only thin coal in the Flag bed, at altitude 1,310. Sandstones in cliffs are above and below all three of these beds.

On the right of the road and left of the fork, below this Flag opening, a wet entry into the Hazard bed has at its mouth about 42 inches of coal, the lower 12 inches hidden in water. Its altitude is 1,260. Three feet of shale intervenes between the coal and sandstone above it.

On the left, $1\frac{5}{8}$ miles up the fork, the Haddix bed has been opened and now shows under 4 feet of sandstone, about $1\frac{1}{2}$ feet of coal, with possibly $2\frac{1}{2}$ feet more hidden. Its altitude is 1,200.

On the right, 2 miles up Curley fork, Wise Combs has a five-yard entry into the Haddix coal, giving, at its mouth, 38 inches of coal, under sandstone roof, at altitude 1,170.

Above this he has a ten-yard entry into the Hazard bed, which, 2 yards in, has, under sandstone, 48 inches of coal, including 3 inches of bone coal, 8 inches from the bottom. Its altitude is 1,230.

On the right, $2\frac{1}{8}$ miles up, James Combs has a five-yard entry into the Haddix bed, at altitude 1,175, under 7 feet of sandstone, with about 34 inches of coal at the mouth and 38 inches at the face.

On the left, $2\frac{1}{4}$ miles up, 5 feet above Curley fork, Mr. Combs has a wet entry into the Haddix coal, about 47 inches thick at the mouth, covered by 10 feet of very soft, friable sandstone. The altitude is 1,180.

Across, on the right of the branch, he has a six-yard wet entry into the Hazard coal, at altitude 1,240,

under 5 feet of sandstone, with 31 inches of coal, the bottom 6 inches not seen and the bone coal apparently present.

CAMPBELL BRANCH.—On the right, $1\frac{3}{4}$ miles up Brown fork: Altitude of mouth, 900.

On the left, $\frac{1}{4}$ mile up a left branch, $\frac{1}{8}$ mile up Campbell branch, an unfinished prospect into the Hazard bed, at altitude 1,210, shows over 3 feet of coal, and is reported to be 4 feet thick. Overlying the coal is 3 feet of shale, upon which is massive sandstone.

On the left, $\frac{1}{4}$ mile up Campbell branch, Henry Campbell has a sixteen-yard entry into the Flag bed with coal varying from 40 to 45 inches at its face, and with 10 feet of sandstone over it. Its altitude is 1,250.

On the right, $\frac{5}{8}$ mile up the branch, John Campbell has a sixteen-yard entry into the Flag bed, at altitude 1,280, having 48 inches of coal 12 yards in. An inch of bone coal 13 inches from the bottom is included. Overlying the coal is 5 feet of sandstone.

On the left, $\frac{3}{4}$ mile up the branch, Milton Campbell has an entry just starting into the Hazard coal, having 54 inches of coal under 8 feet of shale, at altitude 1,215.

An ample area of both beds is available for mining here.

On the right, $\frac{1}{8}$ mile up a left hollow, $1\frac{7}{8}$ miles up Brown fork, William Couch heirs have a ten-yard entry into the Hazard bed, at altitude 1,200, with 45 inches of coal at its mouth, under 8 feet of sandstone. A half-inch clay parting 17 inches from the bottom probably disappears underground.

A ledge of thin limestone was found below the entry at altitude 1,120 and the Fire-clay coal is probably at about 930, as indicated by the sandstone here under which it lies.

On the left, $2\frac{1}{4}$ miles up the fork, is the following exposure some 20 feet above the stream:

Fire-clay Coal.

Sandstone	10 ft.
Black slate	4 ft.
Coal	2"
Shale	1"
Coal	10"
Clay	1"
Coal	10"
Altitude, 945.	

The lower parting indicates the place of the usual flint fire-clay, as proved by exposures 3 miles up the fork, given below. This is one of the very rare instances in Southeastern Kentucky where the peculiar characteristic of the parting is not readily recognized.

On the right, 2½ miles up the fork, Alfred Couch has a three-yard entry, under sandstone, into the Flag coal, at altitude 1,275, giving 46 inches of coal, including an inch of bone 18 inches from the bottom.

On the left, 3 miles up, and on the right at the mouth of Sheep Hollow branch, just beyond, are the following exposures:

Fire-clay Coal.

Sandstone	20 ft.	8 ft.
Black slate		1½ ft.
Coal	11"	9"
Flint fire-clay	5"	2"
Coal	7"	10"
Altitude		975.....980

The upper half of the 5-inches parting is black and the lower half the usual brown.

SHEEP HOLLOW BRANCH.—On the right, 3 miles up Brown fork: Altitude of mouth, 980.

On the head of the branch, ½ mile up, John Campbell has a five-yard entry into the Hazard bed, at altitude 1,305, with, at its mouth, 48 inches of coal and a shale parting of about 2 inches 7 inches from the bottom. Upon it is 3 feet of sandstone.

On a left branch at Mr. Campbell's house, $3\frac{1}{4}$ miles up Brown fork, he has a twelve-yard entry into the same bed at altitude 1,295, with 46 inches of coal at its mouth, and but 38 inches mined at the face, some coal being left in the bottom, probably because of water. The bed is covered by 6 inches of black slate upon which is exposed 3 feet of sandstone.

On the right, $\frac{1}{4}$ mile up a right branch, $3\frac{1}{2}$ miles up the fork, Mark Standiford has a nine-yard entry into the Hazard bed, at altitude 1,230, with about 47 inches of coal, as measured half way in. Upon the coal is 8 feet of shale.

On the left, $\frac{1}{4}$ mile up a left branch, $4\frac{1}{4}$ miles up the fork, William Creech has an eight-yard entry into the Flag bed, at altitude 1,310, which has, at its mouth, 36 inches of coal under 4 feet of sandstone.

BULL FORK.—On the right, $4\frac{1}{2}$ miles up Brown fork: Altitude of mouth, 1,070.

On the right, $\frac{1}{2}$ mile up Bull fork, W. Turner has an eight-yard entry with the following section at its mouth, 4 inches of the bottom coal at the face apparently left for drainage:

Flag Coal.

Sandstone	4 ft.
Coal	14"
Shale	4"
Coal	40"
Altitude, 1340.	

On the right of Brown fork, $4\frac{3}{4}$ miles up, Matt Rich has a three-yard partly covered entry into the Flag bed, at altitude 1,350. The bed, under 10 feet of sandstone, appears to be 4 or 5 feet thick.

The Hazard bench shows plainly 60 feet under this and the preceding opening with the cliff directly under it here, but on Brown fork generally, bench and cliffs are far less conspicuous than on streams given on the preceding pages of this report.

Both the Hazard and the Flag beds give abundant area for mining in this vicinity.

On the right, $\frac{1}{4}$ mile up a right branch, 1 mile up Big creek, Silas Crawford has a wet entry with the following section at its mouth, the bottom of the coal in water not seen:

Hazard Coal.

Shale	8 ft.
Coal	2"
Shale	3 ft.
Coal	6"
Shale with coal	18"
Coal	26"
Clay	1"
Coal	33"
Altitude, 1200	

The upper 6 inches of the 26-inch seam is left to support the otherwise very weak roof. There is a good area of the coal here, but its quality was not ascertained.

COAL HARBOR BRANCH.

On the right, $1\frac{1}{4}$ miles up Big creek: Altitude of mouth, 845.

Along the road up to this branch to Little Willard Creek, the stain of the Hamlin coal was noted at altitude 1,035. Another at altitude 1,120 is probably a slip from the Haddix bed, which shows its stain at altitude 1,140, also probably below its normal level.

On the right of the road and branch, $\frac{1}{2}$ mile up, an abandoned entry into the Hazard coal, at altitude 1,220, under 8 feet of shale, shows 3 feet of coal and a probable thickness of bed of 4 or 5 feet. The gap to Little Willard creek, $\frac{1}{4}$ mile beyond, is 35 feet lower than the entry and the area of coal in this vicinity is not great, but sufficient for mining if the coal proves satisfactory in quality.

At $1\frac{1}{2}$ miles up Big creek one seam of the Whitesburg coal, under black slate, goes below drainage at altitude 850.

At 2 miles up another seam of the same bed, 12 inches of coal, under 2 feet of shale, goes below drainage

at altitude 870, while a third, probably the upper one, is exposed on the left, 20 feet higher, 8 inches of coal under sandstone. This goes under $2\frac{1}{2}$ miles up.

In a rock house on the right, $\frac{1}{8}$ mile up a right branch, $2\frac{1}{8}$ miles up Big creek, is the following exposure:

Fire-clay Coal.

Sandstone	8 ft.
Shale	1 ft.
Black slate	1 ft.
Flint fire-clay	4"
Coal	11"
Fire-clay.	
Altitude, 925.	

On the right, $\frac{3}{4}$ mile up the same branch, an unfinished prospect shows coal of the Flag bed, at altitude 1,260, under 20 feet of sandstone.

On the left, $\frac{1}{8}$ mile up a left hollow, $2\frac{3}{8}$ miles up the creek, a prospect into the Hamlin coal has been made at altitude 1,025.

Above this prospect Granville Fields has a fifteen-yard entry with the following section 3 yards in:

Flag Coal.

Sandstone	4 ft.
Coal	34"
Bone coal	3"
Coal	2"
Altitude, 1265.	

On the left, $2\frac{3}{4}$ miles up the creek, Fulton Fields has a closed entry into the Hazard bed, under shale, said to have 4 feet of coal. Its altitude is 1,210.

Above this is a long entry into the Flag bed with 37 inches of coal 5 yards in, under sandstone, at altitude 1,260.

The Fire-clay coal shows in a slip on the left, 3 miles up, at altitude 925.

AMY FORK.

On the right, 3 miles up Big creek: Altitude of mouth, 886.

On the left, $\frac{1}{4}$ mile up the fork, Jerry Wells has a prospect, under 5 feet of sandstone, into the Flag bed at altitude 1,285, apparently $4\frac{1}{2}$ to 5 feet thick, with 3 feet of coal visible.

On the left at creek level, $\frac{1}{2}$ mile up, is the following exposure:

Fire-clay Coal.

Black slate and shale	2 ft.
Shaly sandstone and shale	12 ft.
Coal	3"
Flint clay	4"
Black slate	1"
Coal	2"
Altitude,	925.

The flint clay here may easily be mistaken for black slate on cursory examination.

STEEP FIELD BRANCH.—On the left, $1\frac{1}{2}$ miles up Amy fork: Altitude of mouth 1,015.

Thin coal at altitude 1,020, in the branch, $\frac{1}{8}$ mile up it, is probably the top of the Fire-clay coal rider.

On the right, $\frac{1}{4}$ mile up the branch, John Morgan has a long entry on a prominent bench, giving the following section:

Flag Coal.

Sandstone	5 ft.
Black slate	2 ft.
Coal	33"
Bone coal	2"
Coal	2"
Altitude,	1290.

On the right, $\frac{1}{4}$ mile up a right branch, $\frac{3}{8}$ mile up Steep Field branch, Rufus Fields has an eight-yard entry, the section of which with analysis for the survey of my recent sample from the face follows:

Flag Coal.

Massive sandstone	10 ft.
Coal	30"
Slaty coal	2"
Coal	12"
Fire-clay.	
Altitude, 1330.	

Analysis.

Lab. No. G-3675

Moisture	1.90
Volatile combustile matter	37.97
Fixed carbon	49.43
Ash	10.70
	100.00
Sulphur	1.08
B. T. U.	13,372.

The analysis shows a poor coal, but the lower 14 inches, which is the bearing-in coal, has, as indicated in sampling, a much larger proportion of ash than the upper 2½ feet. As the bearing-in coal goes mostly to slack an excess of ash in it is of little importance, and the remaining coal should stand well in marketing. The upper seam has some splint coal.

On a right branch, ¾ mile up Steep Field branch, on the right of its left fork, and ½ mile from main Steep Field branch, Levi Couch has a twelve-yard entry into the Flag coal at altitude 1,380, giving, under sandstone, 36 inches of coal 5 yards in. This bed has some 200 feet of covering in this region giving ample area for mining operations.

In Amy fork, 1¾ miles up, altitude 1,040, is black slate about 10 feet over the probable Fire-clay coal rider noted ⅛ mile up Steep Field branch.

On the right at this point, Bud Couch has a twenty-five-yard entry into the Flag coal at altitude 1,340, under sandstone, with 39 inches of coal at 2 and at 20 yards in. The coal is hard at the bottom, but becomes rather softer a foot up. Its cleavage is irregular.

On the right, 1⅞ miles up, a coal stain in the road,

8 inches thick, on 4 feet of shale marks the place of the Hamlin coal, from which it is figured that the Fire-clay coal bed is about 40 feet below drainage here.

Limestone shows in the road just beyond the coal stain at altitude 1,120, but it may have slipped somewhat from its normal position.

On the right of a right branch, 2 miles up, Henry Fields has a fifteen-yard entry with bed section and analysis by the survey, of the coal from my recent sample taken at the face, as follows:

Flag Coal.

Massive sandstone 10 ft.
Coal 39"
Fire-clay.
Altitude, 1340.

Analysis.

Lab. No. G-3674.

Moisture	2.10
Volatile combustible matter	38.50
Fixed carbon	53.06
Ash	6.34
	100.00
Sulphur	.83
B. T. U.	14,229.

The coal when sampled seemed to be rather slaty, especially the lower 4 inches, but that in the dump gave no such indication nor does the analysis show it seriously detrimental. Although well up toward the top of the hill there is still a good workable area of the bed.

Sixty feet below the entry is the bench of the Hazard bed and 15 feet below that the top of a 40-foot cliff above the Haddix bed.

On John Fields' land in this vicinity, but with definite location not now known, the Hindman bed was opened for the Survey by Mr. Proffitt and the lower 36 inches of coal was sampled by him. The section of the bed and analysis of the outcrop coal by Dr. R. Peter follows:

Hindman Coal.

Sandstone.	
Cannel coal	6"
Shale	10"
Coal	19"
Shale	1"
Coal	36"
Altitude, 1410 (?)	

Analysis.

Lab. No. 2,783.

Moisture	3.50
Volatile combustible matter	35.30
Fixed carbon	53.14
Ash	8.06
	100.00
Sulphur	1.035
Specific gravity	1.333
Coke	dense.

"A weathered sample of splint coal. Some fibrous coal between the thin laminae but no appearance of pyrites. Some ferruginous incrustation." The rider of cannel coal is not known to it elsewhere. The ridges here are too low and narrow to furnish any very great amount of coal from this bed, but there is sufficient to warrant working it when transportation facilities are supplied to the lower beds. The altitude as given above is probably 50 to 100 feet too low.

On the left of Amy fork at the mouth of the branch just noted, limestone shows 10 feet above it (possibly slipped from a higher level), presumably about 50 feet above the Fire-clay coal.

The black slate in the fork, $1\frac{3}{4}$ miles up, appears in it again at $2\frac{1}{4}$ miles up and at $2\frac{3}{8}$ miles up, nearly, the limestone, 10 feet higher and fossiliferous here, shows at the branch at altitude 1,100. It is but 10 inches thick and rests on a layer of hard sandstone 2 feet thick.

On the left, $\frac{1}{4}$ mile up a right branch, $2\frac{3}{8}$ miles up the fork, Walter Fields has a one-yard entry into the Flag bed with solid coal as given following:

Flag Coal.

Sandstone.	
Coal	10"
Clay	1"
Coal	29"
Black slate.	
Altitude, 1350.	

The bed has a northeasterly dip of some 10% as at the entry next given, but there is nothing in the topography to indicate more than a very narrow limit to such excessive inclination of strata.

On the left, 3 miles up Amy fork, and 50 feet above it, Cady Shepherd has a ten-yard entry on a bench 50 feet above the fork, under 10 feet of argillaceous sandstone, into the Hazard bed probably, at altitude 1,290. The coal, 37 inches thick at the face of the entry, is bright and hard excepting toward the bottom where it is somewhat softer.

Correlation here is quite uncertain, the dip of the coal 10% in the entry but not so indicated outside, introducing a factor of unknown importance. The bed section is so nearly like those of the preceding entry given and of that farthest up Steep Field branch that correlation with those would be justified, but that the height and occurrence on a bench (which is not apt to be the case with the Flag coal), indicate the Hazard bed.

Being near the bottom of fairly high hills the bed has abundant area, as may be the case with the Hindman bed also.

BOAR BRANCH.

On the left, 3½ miles up Big creek: Altitude of mouth, 895.

On the right, ⅛ mile up the branch, at the head of a right drain, Mrs. Charles Fields has a six-yard entry with the following section at its face:

Hazard Coal.

Shale	1 ft.
Coal	2"
Shale	2"
Coal	57"
Altitude, 1220.	

This entry, $\frac{1}{2}$ mile above Amy fork, in connection with one into the same bed at altitude 1,210, $\frac{1}{4}$ mile below the fork, gives excellent opportunity for finding the interval between it and the Fire-clay coal at the mouth of Amy fork, which, by barometer, is 290 feet.

Black slate in square blocks in the creek 4 miles up, at altitude 905, is about 30 feet below the Fire-clay coal.

On the right, $4\frac{1}{4}$ miles up, Wilson Baker has a twenty-five-yard entry into the Hazard coal at altitude 1,225, giving at its face 58 inches of clean coal under shale.

In the creek, $4\frac{1}{2}$ miles up is a foot or two of limestone at altitude 920, about 20 feet below the Fire-clay coal.

WHITTAKER BRANCH.

On the right, $4\frac{7}{8}$ miles up Big creek: Altitude of mouth, 927.

On the left, $\frac{1}{8}$ mile up, are thin coals at altitudes 960 and 975, the latter over black slate showing also, on the same level, $\frac{1}{4}$ mile up and in the branch. On the left, $\frac{1}{4}$ mile up, are two coals of 3 inches each, in shale, at altitudes 990 and 1,010. One or more of these four seams, ranging from 20 to 70 feet above the Fire-clay coal, doubtless represents its rider. The remainder and included strata, apparently mostly shale, are not intrusions thickening the series, but occupy the place, in part, of sandstone usually found at this horizon.

Again on the left, $\frac{1}{4}$ mile up the branch, limestone appears at altitude 1,115, and above that Peter Whitaker has a twenty-five yard entry into the Hazard bed at altitude 1,230, having 57 inches of coal at its face and reported to have 3 or 4 inches more coal under a parting at the bottom. It has 4 feet of shale covering under sandstone.

On the right at the school house, $5\frac{1}{4}$ miles up Big creek, is the following section:

Sandstone	10 ft.
Shale	4 ft.
Black slate	1 ft.
Coal	1 ft.
Mostly shale	15 ft.
Sandstone	20 ft. (to creek).
Altitude, 975.	

On the right, $5\frac{1}{2}$ miles up, R. B. Fields has a ten-yard entry into the Flag bed at altitude 1,225, with 55 inches of coal at its face, and reported 11 inches of coal under 2 inches parting beneath. The roof is shale.

In the creek, $5\frac{3}{8}$ miles up, the Fire-clay coal is at altitude 945. A pit from which the coal was taken is about 2 feet deep and is said to have 2 feet of coal. From indications down the creek it is unlikely that the bed here amounts to much.

On the left at this point, R. B. Fields has an abandoned entry into the Hazard (?) coal, at altitude 1,245, under 10 feet of shale. The coal at the mouth of the entry is entirely covered, but the dump shows cannel coal present there.

WOLF BRANCH.

On the right, $5\frac{7}{8}$ miles up: Altitude of mouth, 955.

One of the thin seams of coal found low down on Whittaker branch shows $\frac{1}{2}$ mile up this branch and in it, 8 inches thick, at least, and possibly considerably more, at altitude 1,020.

On the right of the branch, $\frac{3}{4}$ mile up, the Combs heirs have a long entry with the following section at its mouth, the lower 5 inches in water and not seen:

Hazard Coal.

Sandstone	2 ft.
Covered	5 ft.
Shale	2 ft.
Coal and shale	4"
Shale	6"
Coal	59"
Altitude, 1220.	

In Big creek, $6\frac{1}{8}$ miles up it, is another pit sunk into coal at altitude 960, reported without parting and 47 inches thick. If such is the case and it is of the Fire-clay coal bed, as is most probable, it augurs well for mines near Hazard driving in this direction, though, with the variations shown in the bed farther down the river and with the bed known to be thin south and west from here, full reliance should not be placed on this one favorable indication.

BENS BRANCH (ORCHARD HOLLOW).

On the left, $6\frac{1}{4}$ miles up: Altitude of mouth, 975.

On the right, $\frac{1}{4}$ mile up the branch, Andrew Brown-
ing has a new opening into the Hazard bed at altitude 1,235, showing about 5 feet of coal under one foot of shale. It is on an unusually broad bench.

NIGGER (JENNY LICK) BRANCH.

On the left, $6\frac{3}{8}$ miles up Big creek: Altitude of mouth, 980.

On the left, $\frac{1}{4}$ mile up, Irvine Eversole has a four-yard entry into the Hazard coal at altitude 1,270, giving, half way in, 58 inches of coal, under 4 feet of shale.

On the left, 1 mile up, Irvine (formerly Alfred) Eversole has a six-yard entry with the following bed section as given in a previous report. The entry is now closed but its covering is exposed:

Hazard Coal.

Shale	4 ft.
Thin coal.	
Shale	3 ft.
Coal	44"
Shale	2"
Coal	18"
Altitude, 1230.	

On the right, $6\frac{3}{4}$ miles up Big creek, 280 feet above it, Matt Granover (formerly Alfred Eversole), has a ten-yard entry with the following section at its face, to which should probably be added 4 to 6 inches of coal at the bottom supposed to be left for drainage. Forty

feet higher is the Flag bed containing cannel coal, but it appears never to have been opened in this vicinity.

Hazard Coal.

Sandstone	8 ft.
Coal	2"
Shale	2 ft.
Coal	54"
Altitude, 1265.	

This is all good, clean-looking coal.

A former measurement of the same bed in a pit on a spur in the close vicinity gave 62 inches of coal and 10 inches parting 16 inches from the bottom, but as the parting and bottom coal were in water and the floor somewhat uncertain the lower thicknesses may need correction.

JACK'S BRANCH.

On the right, $7\frac{1}{8}$ miles up: Altitude of mouth, 997.

A quarter mile up Jack's branch to Minyard branch on the right, and on the left, $\frac{1}{4}$ mile up the latter, Elihu Minyard has a closed entry into the Hazard bed, having 4 or 5 feet of coal, 4 feet visible, at altitude 1,245. On the coal are 5 feet of shale overlain by sandstone.

BUFFALO FORK.

On the left, $7\frac{3}{4}$ miles up Big creek: Altitude of mouth, 1,025.

On the right of the branch at its mouth is coal at altitude, 1,035, said to be 2 feet thick.

On the right, $\frac{1}{8}$ mile up, are 12 inches of coal under 4 feet of sandstone at altitude 1,065. The Hamlin bed appears here to be separated into two parts by 30 feet of shale principally.

On the left, $\frac{1}{8}$ mile up, Link Eversole, Jr., has a four-yard wet entry into the Hazard bed at altitude 1,215, having, under shale, about 5 feet of coal.

On the right, $8\frac{1}{4}$ miles up Big creek, John Eversole has a closed entry into the Hazard bed at altitude 1,315.

On the left, 9 miles up, Link Eversole has a twelve-yard entry with the following section, as obtained, the upper half at its face and the lower half at its mouth:

Hazard Coal.

Sandstone	3 ft.
Coal	22"
Clay	2"
Coal	27"
Shale	3"
Coal	4"
Altitude, 1315.	

A broad bench marks the outcrop of this bed at nearly every opening down the creek, and this together with the uniformity in altitudes serves for determination of the correlation of this and of the following opening in disregard of the differing bed sections and roofs.

The entry is 170 feet above the creek here.

Bearing to the left from Link Eversole's, $9\frac{3}{4}$ miles up Big creek to a branch on the right at the "Long Rockhouse," and on the left $\frac{1}{8}$ mile up the branch, 10 feet above it, is a four-yard entry, partly closed, having the following section:

Hazard Coal.

Sandstone	4 ft.
Coal	23"
Clay	2"
Shelly coal and clay..	$1\frac{1}{2}$ ft.
Clay	$1\frac{1}{2}$ ft.
Coal	36" (?)
Altitude, 1295.	

The lower seam, measured in $1\frac{1}{2}$ feet of water on a previous visit, may possibly be not clean coal. The shelly coal and clay were so interleaved as to make useless any attempt to separate measurements. At the outcrop the shelly coal was not apparent, and the prospect is therefore favorable that on farther entrance the clay interleaved with the coal will disappear quickly. In fact, the numerous entries into this bed on Big creek, as well as others across the ridge on Macies creek, show

that this opening has developed abnormal conditions, besides which an apparent roll shows in the entry, giving another reason for believing such conditions confined to narrow limits. The two partings in the Link Eversole entry, however, indicate some change of character of the bed about the head of the creek.

On the right at the head of this branch, $\frac{1}{2}$ mile up it, an unfinished prospect into what may be of the Hindman bed, though probably too high for it, at altitude 1,575, shows about $3\frac{1}{2}$ feet of coal under 5 feet of shale. The opening is 15 feet above the gap there to Macies creek.

Along the dividing ridge to the right near a bridle-path across it, the Hindman bed shows a stain of 5 to 6 feet thickness at altitude 1,595. Though high in the hill the rise of peaks 300 to 400 feet higher may give attractive areas for mining when transportation to lower beds is provided.

THE COALS OF CARR FORK.

THE COALS OF CARR FORK.

In the last decade there has been an almost complete abandonment of wood fires by the inhabitants of Eastern Kentucky, coal being now in general use. This has led to the making of many openings, which during the winter are accessible, but in summer are often banked up with falls of earth from the mouths of entries. Exposures enough remain, however, to give, in most localities, a fairly accurate knowledge of the bed best adapted to local use, and occasional other prospecting helps to carry correlations through the region and give a general knowledge of nearly all the beds of the field.

Strata above drainage in this region include about 600 feet above the Fire-clay coal bed and 250 feet below it, but only in the river hill between Big branch and Bull creek can they all be found in one locality.

The principal bed of the region is unquestionably the Fire-clay coal. On it main dependence must be placed, while other beds are regarded as the source of additional supply wherever they provide workable areas. This coal is of workable thickness in all but a few small parts of the region, as the detailed description comprising the bulk of this report shows; its principal coal seam (the upper bench) is of exceptionally good and uniform quality and its under seam has much good coal in it, including cannel at one point; its roof is usually a good sandstone even when it appears as shale on the outcrop—so good that the farmer miner will abandon a thicker coal in preference to it, and the bed is at moderately convenient height throughout the region, covering probably over three-quarters of it.

The Whitesburg bed seems to vary in its distance from the Fire-clay coal, from about 25 feet below it to as much as 100 feet, the latter on Collins branch where it is in part cannel coal. On Little Carr it is also partly cannel, but at neither place does it add to the value of

the bed. With varied section, including more or less of partings, its workable area is probably limited to Carr fork from Breeding to Branham creeks, with possibly half of the branches included.

The Amburgy bed, uniformly about 200 feet below the Fire-clay coal, is probably workable along Carr fork from Irishman creek (where it is slightly below drainage) to Deer fork, but elsewhere it is too thin or too much cut up by partings, and such condition is to be expected of it away from the immediate vicinity of Carr fork, where it is below drainage and as yet undeveloped.

Attention is here called to a coal bed about 20 feet under the Amburgy, very thin so far as known, and unimportant, but remarkable for its persistency.

Above the Fire-clay coal, its rider and the Flag coal are the only beds known of workable thickness and sufficient area. The rider has been found especially attractive on Smith branch, $17\frac{1}{2}$ miles up Carr, and on Deer fork, but it is generally either much hurt by partings or thin.

The Flag coal continues in this field, so far as known, its condition as shown down the river and on Lots and Lost creeks, a good thick coal, generally without serious partings, under a strong sandstone roof. Wherever its area permits mining it will be most attractive, but there is probably no such area of it above Betty Troublesome creek.

The Hindman bed is lacking in area all through this region excepting at the heads of Yellow creek and on Betty Troublesome. It retains its height of about 530 feet above the Fire-clay coal.

The sandstone directly under the Haddix coal bed seems to be particularly favorable for obtaining good flagstones for local use, several quarries having been noted in that position.

For the new railway up the river good building stones were always obtained at convenient places in this region from near the level of the Amburgy coal bed.

The 20 to 30 feet of cliff-forming sandstone under the Hazard coal retains that characteristic in this region, and in that part of it between Carr fork and Bull creek its excessive hardness has been the chief cause of the

unusually broad areas on or near the tops of the ridges, giving farms and habitations on their comparatively light slopes to which is locally given the name of "flat-woods."

The northwest dip of strata continues, with minor variations, up Carr fork to its head, but along the river it is interrupted by a nearly level, apparently undulating, rise and fall from Carr fork to Bull creek, and a rise up Bull creek, where normally the rocks should be level, to meet the rise up Carr and its branches to opposite the heads of Bull creek.

In the following detailed description is included all observed data of strata noted with a view to obtaining not only the fullest knowledge possible under present conditions of development of all workable beds, but also of such others as may become workable in the future, or may assist in correlation.

Measurements given in inches are exact unless otherwise stated, given in feet are approximate only. Distances in yards are by estimation and in miles as obtained from maps or by report or estimation. In ascertaining distances up Carr fork from its mouth, there may be in the total a considerable error, but for approximate distances from point to point not far apart they may be relied upon.

Altitudes of mouths of streams are very nearly correct as given, recently taken levels having been carried over most of the region. Altitudes of coal openings were determined by barometer, but, with opportunities for reference to those levels usually at hand, the altitudes are far more reliable than were those of former years.

Those entries are designated wet which had water in them (usually six inches to a foot deep) which prevented access to the face of the coal. At them the beds were measured in outcrop, so far as they admitted.

CARR FORK.

Six and one-quarter miles above Hazard. Altitude of mouth, 880.

On the right, $\frac{1}{2}$ mile up, J. P. Combs has a wet entry with the following section:

Fire-clay Coal.

Sandstone	4 ft.
Shale	2 ft.
Coal	4"
Shale	2"
Coal	29"
Bony coal	3"
Flint clay.	
Coal (?).	
Altitude, 1095.	

The total thickness, from the two feet of shale down, is 47 inches; the flint clay is probably not over 4 inches thick, leaving 5 inches or more for coal at the bottom. The bony or slaty coal is not marketable. The roof is good, probably becoming sandstone a few yards in.

On the same property and on the right of the creek an eighth mile farther up, a covered prospect indicates a good thickness of Flag coal at altitude 1,450.

ACUP BRANCH.

On the left of Carr, $11\frac{1}{2}$ miles up. Altitude of mouth, 895.

On the right of this branch, $\frac{1}{4}$ mile up, Sampson Combs has a wet entry giving the following section:

Fire-clay Coal.

Coal stain.	
Shale	1 ft.
Coal	5"
Sandstone	3 ft.
Shale	8 ft.
Coal	6"
Shale	1"
Coal	31"
Flint clay.	
Altitude, 1070.	

A half mile up a branch on the right, $\frac{3}{8}$ mile up Acup branch, in the point of a hill on the left, an abandoned opening shows a possible 4 feet of coal covered, under about 3 feet of shale and 20 inches of coal over

that. Its altitude, 1,480, is high for the Flag coal and low for the one above it.

MILLSEAT BRANCH.—On the right, $\frac{1}{2}$ mile up Acup. The same bed is opened on the right at the head of this branch, $\frac{1}{2}$ mile up it, with the following section at the mouth of a 3-yard wet entry:

Flag (?) Coal.

Sandstone.	
Coal	19"
Shale	10"
Coal	43"
Altitude, 1465.	

Both openings are on Edward Combs' land. A prominent bench lies 60 feet higher.

On the left of Acup branch at its level, $\frac{5}{8}$ mile up, the following is exposed in a cliff:

Whitesburg Coal.

Massive sandstone.	
Shale	20 ft.
Coal	6"
Bone coal	5"
Coal	7"
Coal and shale	3 ft.
Altitude, 1015.	

The coal and shale at the bottom alternate too frequently for measurement.

On the right, $\frac{3}{4}$ mile up and again $\frac{7}{8}$ mile up, Roland Combs has eight-yard and fifteen-yard entries into the Fire-clay coal, the latter at creek level, which give sections as follows:

Fire-clay Coal. 8-yard entry.		Fire-clay Coal. 15-yard entry.	
Sandstone.		Sandstone	15 ft.
Shale	1 ft.	Shale	6"
Coal	2"	Coal	30"
Shale	1"	Flint clay	7"
Coal	5"	Cannel coal	7"
Shale	2"	Black slate or coal.	
Coal	30"	Altitude, 1060.	
Flint clay	5"		
Coal	6"		
Cannel coal	5"		
Coal	7"		
Altitude, 1060.			

The floor of the upper entry, in water, could not be ascertained fully. The flint fire-clay here is black instead of the usual brown, and may easily be mistaken for black slate, or for coal if not inspected closely. The cannel coal appears good.

On the right of a left branch one mile up Acup branch, close to the Roland Combs house, in the branch and 15 feet above Acup branch, the Fire-clay coal rider has the following section:

Fire-clay Coal Rider.	
Sandstone	20 ft.
Shale	4 ft.
Coal	27"
Bituminous slate	5"
Slaty coal	9"
Altitude, 1085.	

The bottom coal, measured in water with difficulty, may be slightly more or less than 9 inches. The slate parting closely resembles the black fire-clay parting of the lower bed. So far as known such parting does not appear elsewhere in this bed, but farther up on Carr and up the river it is often seen as float, washed presumably from the Fire-clay coal, but possibly from its rider.

On the left, a quarter mile up the right fork of Acup and two miles from Carr, a prospect on land of Combs heirs into the Flag bed at altitude 1,425 gives

58 inches of rich, hard, block coal under 4 feet of shale covered by sandstone.

On a right branch, $2\frac{3}{8}$ miles up Carr, on the right, $\frac{1}{8}$ mile up the branch, Benjamin Combs, has a four-yard entry of the following section:

Fire-clay Coal.	
Shale with calcareous concretions.....	4 ft.
Coal	6"
Shale	1"
Coal	8"
Shale with coal	24"
Coal	29"
Flint fire-clay	6"
Shale	8"
Altitude, 1080.	

The bottom shale, which may be thicker than 8 inches, possibly overlies more coal of this bed. The roof is good, indicating a change to sandstone. Five other entries or prospects into this bed have been made on this property, all within a quarter of a mile and all closed.

On the right of a left branch, $2\frac{1}{2}$ miles up Carr, by his house, Washington Combs has a twelve-yard wet entry with the section following:

Fire-clay Coal.	
Sandstone	8 ft.
Shale	6 ft.
Coal	39"
Flint clay	8"
Coal	7"
Black slate floor.	
Altitude, 1070.	

More coal was reported below the floor, which was felt but not seen. The 7-inch coal was not measured exactly.

On the right, 3 miles up Carr, a twelve-yard entry, and on the left a closed entry, $3\frac{1}{4}$ miles up, both of Robert Combs, give the Fire-clay coal and its rider, or at least a part of the rider.

Fire-clay Coal.		Fire-clay Rider.	
Sandy shale	10 ft.	Shale	4 ft.
Coal	38"	Coal	2 ft.
Flint clay	3"	Shale	$1\frac{1}{2}$ ft.
Coal	5"	Coal	8"
Black slate	3"	Shale	2"
Clay.		Coal	3"
Altitude, 1050.		Shale	8 ft
		Fire-clay coal.	
		Altitude, 1050.	

WHITE OAK BRANCH.

On the left, $3\frac{1}{2}$ miles up Carr. Altitude of mouth, 915.

On the right of this branch, $\frac{5}{8}$ mile up it, is 14 inches of coal of the Whitesburg bed probably, at altitude 1,040, with 2 feet of shale and then sandstone, mostly thin-bedded, to the bed above it.

On the right of the branch, $\frac{3}{4}$ mile up and 10 feet above it, Short Gardner has a seven-yard wet entry in 38 inches of coal, with a hard floor and sandy shale roof; its altitude is 1,065.

SCUDDY BRANCH.

On the right, 4 miles up Carr. Altitude of mouth, 920.

In the branch, a half mile up, is 11 inches of coal under 8 feet of shale at altitude 1,040 and on the right, 25 feet higher, 6 inches of coal on 5 feet of fire-clay and under $1\frac{1}{2}$ feet of shale and a 25-foot sandstone cliff. This may be the beginning of a bed, 100 feet under the Fire-clay coal, which assumes considerable importance farther up Carr, but there it has thick shale over, as well as under it.

On the left, $\frac{3}{4}$ mile and one mile up, John Mullins has eight-yard and twelve-yard entries which give the following:

Fire-clay Coal.

Sandstone	1 ft.	Sandstone	5 ft.
Shaly sandstone	1 ft.	Coal	30"
Coal	37"	Flint clay	4"
Flint clay	5"	Coal	13"
Coal	5"	Fire-clay.	
Black slate	4"	Sandstone.	
Coal	4"	Altitude, 1150.	
Altitude, 1140.			

The bottom coal at the higher entry has a knife-edge of black slate at the face, decreased from 3 inches between two 6-inch seams of coal at the mouth of the entry.

On the left at the forks, $1\frac{1}{2}$ miles up, at stream level, on John Combs' land, is the following:

Hamlin Coal.

Shale	10 ft.
Coal	7"
Shale	6"
Coal	6"
Shale	3"
Coal	10"
Altitude, 1280.	

By the house, on the right, some 50 feet higher, an opening has been made into what is probably the Had-dix bed, but the prospect is wholly closed.

On a left branch, $4\frac{1}{2}$ miles up Carr, on the left, $\frac{1}{8}$ mile up it, J. P. Combs has a five-yard entry with the following section:

Fire-clay Coal.

Coal	36"
Bone coal	3"
Coal	4"
Flint clay	3"
Coal	3"
Black slate	7"
Clay.	
Altitude, 1060.	

Only the 36 inches at the top is mined.

GEORGE'S BRANCH.

On the right, $4\frac{1}{2}$ miles up Carr. Altitude of mouth, 925.

On the left of a left branch, $\frac{1}{4}$ mile up George's branch, $\frac{1}{8}$ mile up the left branch, J. J. Mullins has a wet entry giving 36 inches of coal at its mouth. An adjacent entry formerly gave to the writer 39 inches of coal with 6 inches of black-jack and black slate below.

At $\frac{3}{4}$ mile up Allen Sumner has a wet entry on the left, and on the left of a right branch, $\frac{1}{4}$ mile up it, Jesse Combs has an eight-yard entry. Their sections are:

Sumner.		Fire-clay Coal.		Combs.	
Sandstone	5 ft.			Sandstone	10 ft.
Coal	41"			Coal	21"
Flint clay	5 to 6"			Flint clay	6"
Coal.				Coal	11"
Altitude, 1145.				Altitude, 1155.	

In each of these the fire-clay parting is black, resembling slate. In the Sumner entry the roof is noticeably good. In the Combs entry the massive sandstone is uneven at bottom and the coal follows its irregularities. On one side of the entry near the top, a thin sandstone parting appears, which runs down towards the middle of the bed and apparently culminates and ends in a 6-inch ball at the face. This freakish sandstone and great reduction of the upper coal are not likely to extend far. The measurements given are from the mouth of the entry. At the face the parting is about half as thick, but the effective coal is reduced by a little coal sticking to the fire-clay.

A mile up to the forks of the creek, and $\frac{1}{4}$ mile up the left fork, 15 feet above it, an eight-yard entry on the left and at water level, and a two-yard entry on the right, both in the Fire-clay coal at altitude 1,200, give 33 inches of coal on 5 to 8 inches of black flint fire-clay with coal below, 4 inches thick in the latter entry. Five feet of sandstone shows above them.

On the left of the right fork, $\frac{1}{4}$ mile up it, 30 feet above stream, and on the right, $\frac{1}{2}$ mile up, 10 feet above

stream, in a 20-yard entry of Robert Combs, the following sections were taken:

On Left.		On Right.	
Sandstone	5 ft.	Sandstone	15 ft.
Coal	44" (?)	Coal	40" (?)
Flint clay.		Flint clay	6"
Shale	30 ft.	Coal	5"
Altitude, 1210.		Clay	1 ft.
		Sandstone.	
		Altitude, 1210.	

It is possible that a black-jack of some 4 inches thickness lying on the flint fire-clay is included as coal in the foregoing.

The rock-house on the right just beyond the Combs entry, 3 feet above the stream has in it about the same section as the entry.

MONTGOMERY BRANCH.

On the right, $5\frac{3}{8}$ miles up Carr. Altitude of mouth, 935.

From this branch at its mouth a cliff rises of some 30 feet of shale, with 40 to 50 feet of sandstone on top of that, carrying the measures nearly to the thin coal 100 feet below the Fire-clay coal.

In a left branch, a mile up Montgomery, 9 inches of coal at altitude 1,030 (the 6-inch coal of Scuddy) is covered by 5 feet of shaly and 20 feet of more massive sandstone.

On the right, $\frac{1}{4}$ mile up the branch, on D. Combs' land, is a prospect into the Fire-clay coal, fallen in, but with 3 feet of coal still visible under 15 feet of shale; its altitude, 1,115. In the first right drain below, a prospect revealed the following:

Fire-clay Coal Rider.

Shaly sandstone	5 ft.
Coal	6"
Shale	1"
Coal	7"
Shale	3"
Coal	14"
Shale	10"
Coal	9"
Shale	2"
Coal	5"
Altitude, 1140.	

A total of 45 inches of coal in a bed of 57 inches total thickness.

On the right $1\frac{3}{4}$ miles up, Judge Combs has a prospect into the Fire-clay coal with section given below approximately.

KELLY FORK.—On the left, 2 miles up Montgomery branch. Altitude of mouth, 1115.

On the left, $\frac{1}{4}$ mile up this fork, Judge Combs has a wet entry with the section following:

Fire-clay Coal.

Prospect.		Entry.	
Shale	15 ft.	Shale	5 ft.
Coal	44"	Coal	58"
Flint clay	4"	Flint clay	2"
Coal	5"	Coal	2"
Altitude, 1145.		Altitude, 1160.	

The flint fire-clay is black and possibly should include 3 or 4 inches of what is given as coal above it.

On the right, $\frac{7}{8}$ mile up Kelly fork, the top seams and parting of the rider are exposed 25 feet above the Fire-clay coal.

On the left, at the forks of Kelly fork, 1 mile up, 40 inches of the main seam of the Fire-clay coal was seen, but not the bottom. Under it is 4 inches of flint fire-clay and below that 3 inches of black slate. Five feet of shale covers the bed. Its altitude here is 1,265.

On a right branch, $2\frac{1}{4}$ miles up Montgomery branch, on the left $\frac{1}{8}$ mile up the branch, Robert Summers has

an opening as given below: With it is given the section at a wet entry on the left, $\frac{1}{4}$ mile up and 55 feet above the right fork which is $2\frac{1}{2}$ miles from Carr.

Fire-clay Coal.	
Summers.	Right Fork.
Shale 10 ft.	Sandstone 5 ft.
Coal 39"	Coal 25"
Flint clay 5"	Black-jack 3"
Coal 6"	Flint clay 5"
Altitude, 1195.	Coal 7"
	Altitude, 1220.

On the right, 4 miles up Montgomery branch, Green Combs has a three-yard wet entry, 355 feet above the creek, into what is believed to be the Flag coal with the following section:

Flag (?) Coal.	
Sandstone 10 ft.	
Coal 16"	
Shale 3"	
Coal 43"	
Altitude, 1695.	

The bottom foot of the bed was not seen and its measurement may not be quite correct.

The correlation of the bed is on the assumption that the rise of strata continues up Montgomery branch from the last Fire-clay coal opening to this point. There appears a further slight continuation to openings of this same high bed on the heads of Bull creek, but the barometer was too inaccurate for certainty. The correlation is strengthened by the character of the bed and its roof.

The ridge northwest of Bull creek and around its head (as well as down on the north of Big branch past the head of George's branch) is broad at the top forming what is known as "Flatwoods." Between the mouth of Bull creek and the river northwest of it, this unusual topography is principally due to the excessive hardness of the 20 to 30 feet of well-known cliff rock underlying the Hazard coal, and it is difficult to believe that the same rock is not the prime cause at the head

of Montgomery branch. If this were the case, and to make the stratification and topography conformable to that at the river, the Flag bed should be 100 feet lower than the Green Combs coal, which would make the latter either the Hindman bed or the Francis bed 50 feet below it. The Hindman bed has been opened in the river ridge and presents its usual characteristics of extremely thick coal under abominable roof, wholly different from the Green Combs and heads of Bull creek openings: In this connection is noted a very hard sandstone at the gap between Bull creek and Defeated branch directly under what is assumed to be the Hazard coal and 65 feet under one of these latter Flag coal openings.

On the right of the left fork above Green Combs', $4\frac{1}{2}$ miles from Carr, Harrison Banks has a nearly closed entry into the (probable) Haddix bed giving about 34 inches of coal under 8 feet of shale at altitude, 1,585.

STACEY BRANCH.

On the left, $5\frac{1}{2}$ miles up Carr. Altitude of mouth, 935.

In a drain on the left, $\frac{1}{8}$ mile up, two covered prospects in coal apparently thick enough to work, are probably of the Fire-clay coal; their altitude 1,095 and 1,100. They seem to show an up-stream dip to the wet entry on the right, some 20 feet above the branch, which has the following section:

Fire-clay Coal.

Rough sandstone 5 ft.

Coal 44"

Flint clay.

Coal.

Altitude, 1045.

Neither the bottom coal nor the fire-clay, which is black here, was accessible for measurement.

YELLOW CREEK.

On the left, $5\frac{3}{4}$ miles up Carr. Altitude of mouth, 940.

A quarter mile up the creek and $\frac{1}{8}$ mile up a left drain, Samuel Combs has a twelve-yard entry with the following section:

Fire-clay Coal.

Sandstone	15 ft.
Coal	41"
Flint clay	4"
Coal	9"
Altitude, 1090.	

Again the fire-clay is black and the roof is fine. The sandstone over the entry shows no coal, but in the drain by the opening, 10 feet above it, a 4-inch seam splits into two smaller ones. A slipped stain, probably of the rider, shows 35 feet above the opening.

A covered prospect, one mile up the creek and $\frac{1}{4}$ mile up a left branch and at its level, gives the height of the Fire-clay coal, 1,085, but, a thunderstorm occurring while on this branch, this altitude is not reliable. The 40 feet under the bed is of thin-bedded sandstones and shales with lime boulders, as exposed along the branch, and the covering, 30 feet of sandstone.

On the left, $1\frac{1}{8}$ miles up, the same bed shows about 38 inches of coal, without the parting near the top found in the next opening. Twenty feet of thin sandstones and shales show under the bed, and two thin coals are said to lie 10 to 20 feet above it.

On the right at the creek, $1\frac{3}{8}$ miles up, Addison Combs has a ten-yard entry as follows:

Fire-clay Coal.

Sandstone	15 ft.
Coal	3"
Shale	1"
Coal	32"
Flint clay	4"
Coal	7"
Fire clay	1 ft.
Shaly sandstone.	
Altitude, 1055.	

The flint fire-clay is black.

What coal there is of the rider must come within 20 to 30 feet of the Fire-clay coal, for about 15 feet of sandstone is exposed over the entry and, at the mouth of a left branch $1\frac{1}{2}$ miles up, 40 feet of shales and thin sandstones rise from the creek at altitude 1,075. The rider must go under these.

On the right at the head of the creek, $2\frac{1}{2}$ miles up, is a 20-foot sandstone cliff, its base at altitude 1,435, on which probably lies the Hazard bed; the altitude of the gap to Kelly fork of Lot's creek is 1,554.

A quarter mile southeast of the gap, on a good bench, George Francis has an entry into a bed midway between the Flag and Hindman beds, to which is here given the name of "Francis." Although the bed, as given below, is not so thick as found elsewhere, it is the only known place where its opening is carried underground:

Francis Coal.

Sandstone cliff	30 ft.
Block coal	14"
Black slate	4"
Hard block coal	15"
Altitude, 1570.	

RED OAK (OR ROWDIE) BRANCH.

On the right, $6\frac{1}{2}$ miles up Carr. Altitude of mouth, 945.

An entry into the Fire-clay coal, $\frac{1}{2}$ mile up this branch, taken from Bulletin No. 11, is as follows:

Fire-clay Coal.

Sandstone	10 ft.
Shale	5 ft.
Coal	37"
Shale and flint clay....	9"
Coal	10"

This seems now to be abandoned, although of good thickness.

Coal 16 inches thick runs with and in the branch for nearly a quarter mile to a left branch one mile up.

Fifteen feet above this coal at altitude 1,050 to 1,070 is 5 inches more coal with 10 inches parting under 10 feet of shaly sandstone. These are of the Whitesburg bed.

On the left at the forks, a quarter mile up the left branch, one mile from Carr, Hiram Brashear has a partly covered prospect 10 feet above the branch, from which the following was obtained:

Fire-clay Coal.

Sandstone	10 ft.
Shale	5 ft.
Coal	32"
Bone coal	4"
Flint clay	3"
Coal	7"
Black slate	2"
Bone coal	3"
Coal	6"
Altitude, 1165.	

The bone in the lower seam may be marketed; that in the upper seam must be excluded.

NEGRO BRANCH.

On the left, $6\frac{3}{4}$ miles up Carr. Altitude of mouth, 945.

On the right, $\frac{1}{2}$ mile up, Noah Adams has a five-yard entry with the following section:

Fire-clay Coal.

Sandy shale	3 ft.
Coal	38"
Flint clay	6"
Coal	4"
Black slate	2"
Coal	5"
Clay.	
Altitude, 1085.	

On the right, $\frac{3}{4}$ mile up, is 25 inches of coal with one inch parting 4 inches from the top, under 10 feet of shale.

A 20-foot cliff at the head of the branch, $1\frac{1}{4}$ miles

up, altitude 1,390, gives the approximate location of the Hazard coal just above it. To the right of this cliff Simon Stacey has an eight-yard entry giving the following:

Flag Coal.

Sandstone	25 ft.
Coal	12"
Shale	6"
Clay	1"
Coal	17"
Bony coal	1'
Coal	23"
Altitude, 1470.	

SASSAFRAS CREEK.

On the left, 7½ miles up Carr. Altitude of mouth, 955.

In the left fork at its mouth is a foot, or possibly more, coal under a foot of shale, at altitude 1,020. From this coal to the next, given at the bottom of the following section, is mostly sandstone. This section was obtained ½ mile up the left fork in front of Manton Corbett's house:

Sandstone	8 ft.
Shale	2 ft.
Sandstone	1 ft.
Shale	3 ft.
Fire-clay coal bed	4 ft.—Altitude, 1090.
Fire-clay	2 ft.
Sandstone	2 ft.
Shale	28 ft.
Black slate	1"
Coal	7"
Black slate	1"
Coal	6"
Fire-clay.	
Sandstone in creek.	
Altitude, 1055.	

The following sections of the Fire-clay coal were obtained; one on the left fork 100 yards above the section just given, from the mouth of a wet entry; one on the left of the right fork, ½ mile up it:

Fire-clay. Coal.

Left Fork.		Right Fork.	
Sandstone.		Sandstone	2 ft.
Shale	2 ft.	Coal	24"
Coal	24"	Black-jack	3"
Flint clay	3"	Flint clay	4"
Black slate	3"	Coal	20"
Coal	6"	Clay.	
Bone coal	3"	Altitude, 1085.	
Coal	6"		
Altitude, 1090.			

The roof of the Left fork entry is broken down for about 3 yards in, and the two feet of shale at the mouth there gives place to two feet of good shaly sandstone—a change frequently noted in the roof of this bed, but nowhere else so abrupt. A closed adjacent entry shows 30 inches of top coal.

In the middle of the bottom coal of the Right fork opening is a bone coal running in thickness from nothing to 4 inches. A closed entry on the opposite side of the creek has 7 inches of coal 4 feet above the main seam, apparently a split from it and the cause of its reduced thickness.

KELLY BRANCH.

On the left, 9 miles up Carr. Altitude of mouth, 970.

The Whitesburg bed, with black slate roof, lies in this branch, $\frac{3}{4}$ mile up it, at altitude 1,060, its thickness not ascertained. Below and above it most of the way to the Fire-clay coal, the branch flows on exposed, thin bedded sandstone.

George Kelly has a wet entry a mile up this branch, at its level, with section as given with the Lee Kelly section following. The latter is from a wet entry on the left of a left branch, $9\frac{1}{4}$ miles up Carr, on the left, $\frac{1}{8}$ mile up the branch.

Fire-clay Coal.

George Kelly.

Sandstone	30 ft.
Covered	3 ft.
Coal	7"
Shaly sandstone	5 ft.
Shale	2 ft.
Coal	24"
Black-jack	4"
Flint clay	2"
Coal	19"
Shale in branch.	
Altitude, 1095.	

Lee Kelly.

Sandstone.	
Shale	10 ft.
Coal	2"
Shale	4"
Coal	28"
Black-jack	2"
Flint clay	3"
Coal	17"
Altitude, 1120.	

The bottom coal of the Lee Kelly section is of somewhat doubtful measurement.

IRISHMAN CREEK.

On the right, 10½ miles up Carr. Altitude of mouth, 980.

RIGHT FORK.—One half mile up Irish creek.

On the right, ½ mile up this fork, Spencer Combs has a wet entry where the following section was taken:

Fire-clay Coal.

Sandstone.	
Shale	8 ft.
Coal	24"
Black-jack	3 to 4"
Flint clay	4"
Coal	11"
Clay.	
Altitude, 1200.	

A little coal sticks to the black-jack and even merges into it.

At ¾ mile up a thin coal under massive sandstone shows by the creek, about 100 feet below the Fire-clay coal, its altitude being 1,085.

On the right of a right branch one mile up the fork and ½ mile up the branch, Monroe and William Kelly have a prospect into the Fire-clay coal, at altitude 1,180,

in which the lower members were found but could not be measured. Over the fire-clay the black-jack is 4 inches thick, with 28 inches of coal above it, covered by 3 feet of shale.

At nearly $1\frac{1}{2}$ miles up, a coal about 10 inches thick goes below drainage at altitude 1,170, as noted also at various other points 10 to 20 feet under the Fire-clay coal.

On the right, $1\frac{1}{2}$ miles up, a prospect gives the following:

Fire-clay Coal.

Shale	2 ft.
Coal	28"
Black-jack	2"
Flint clay	4"
Coal	16"
Altitude, 1180.	

At $1\frac{3}{4}$ miles a coal goes below drainage, its thickness probably not over $1\frac{1}{2}$ feet including a thin black slate parting; its altitude 1,245.

On the left, two miles up, Jack Combs has an opening as follows:

Flag Coal.

Sandstone.	
Block coal	9"
Shale	2"
Block coal	42"
Altitude, 1605.	

The height of this bed above the Fire-clay coal seems to be greater here and on Negro branch than at points farther west, but the character of the bed leaves little room for doubt in correlation. Being here but about 50 feet below the level of the gap at the head of the fork, and little more in the spur where opened, its mining area is very small.

TRACE FORK.—On the left of Irishman creek, $\frac{3}{4}$ mile up it: Altitude of mouth, 1,007.

SUGAR BRANCH is on the left of Trace fork, $\frac{1}{4}$ mile up it. On the right, $\frac{1}{4}$ mile up the branch, Patrick Back has a ten-yard entry of following section:

Fire-clay Coal.

Sandstone.	
Shale.	
Coal	24"
Black-jack	4"
Coal	1"
Flint clay	3"
Coal	15"
Altitude, 1120.	

The inch of coal in the parting was not seen in outcrop. The upper six inches of the main coal seam is inclined to resemble cannel coal, and 2-inch blocks of such coal were found in the dump of a covered prospect on the left, $\frac{1}{8}$ mile up the branch. Though clearly shale over the mouth of the entry, the roof is of sandstone 4 yards in.

The forks of Trace fork are $\frac{3}{4}$ mile up it; the altitude there 1,059.

On the right, $\frac{1}{8}$ mile up the Left fork, from a rock-house and prospect above it the following was obtained:

Fire-clay Coal.

Sandstone	3 ft.
Shale	6"
Coal	23"
Black-jack	3"
Flint clay	4"
Coal	17"
Altitude, 1105.	
Covered	10 ft.
Shaly sandstone	5 ft.
Shale	10 ft.
Sandstone	6"
Black slate	3 ft.

Whitesburg Coal.

Bright block coal	6"
Black slate	$\frac{1}{4}$ "
Hard, bright block coal	25"
Altitude, 1075.	
Covered	3 ft.
Sandstone in stream.	

The weathered black slate in the cliff forming the roof of the coal in the rock-house looks exactly like a stained yellow sandstone, and would have been mistaken as such but for the expectation of finding black slate there.

On the right, $\frac{1}{4}$ mile up the left fork of Trace fork, Jasper Watts has a twelve-yard entry, 10 feet above the creek, with this section:

Fire-clay Coal.

Sandstone	5 ft.
Coal	21"
Black-jack	3"
Flint clay	4"
Coal	10"
Sandstone	3"
Coal	7"

The lower parting is a black, bituminous, clay sandstone, which, in an entry 10 yards below, is replaced by 2 inches of impure coal. The upper half of the visible sandstone covering the coal is smooth and massive; the lower half of irregular formation with thin coal seams running through it at varying angles.

On the right fork of Trace fork, on the right $\frac{1}{4}$ mile up it, is an eight-yard entry into the Fire-clay coal and on the left, $\frac{1}{2}$ mile up, 10 feet above stream, is an entry of Joseph Fort's, partly closed.

Sections of these two, the latter measured at out-crop, follow:

Fire-clay Coal.

One-fourth Mile Up.	One-half Mile Up.
Shaly sandstone 15 ft.	Sandy shale 2 ft.
Coal 20"	Coal 18"
Black-jack 2"	Black-jack 2"
Flint clay 4"	Flint clay 4"
Coal 10"	Coal 9"
Black slate 1"	Bone coal 1"
Coal 6"	Coal 6"
Altitude, 1080.	Altitude, 1100.

At $\frac{3}{4}$ mile up, the Fire-clay coal is below drainage. A 20-inch coal under 5 feet of shale and that under sandstone is exposed on the right at altitude 1,165.

On the left, $\frac{3}{4}$ mile up, Valentine Mullins has a closed entry with $3\frac{1}{2}$ feet of coal under 5 feet of sandstone. Though, at altitude 1,465, it appears to be at the right height above the Fire-clay coal for the Hazard bed, the prevalence of Flag coal openings of like thickness induces correlation with the Flag bed.

On the right, $1\frac{1}{2}$ miles up the right fork, Riley Mullins has a ten-yard entry into the Flag bed at altitude 1,525, in which is 40 inches of coal with an inch of shale parting 6 inches from the bottom. On it is 5 feet of massive sandstone.

At $1\frac{3}{4}$ miles up this fork divides again. A quarter mile up the left fork, on the left, T. S. Evans has a twenty-yard entry into 42 inches of Flag coal under sandstone, at altitude 1,505. An inch of hard, black parting some 4 yards in, 7 inches from the bottom, seems not to be continuous, although corresponding in position with the parting in the preceding Riley Mullins entry.

At the head of the right fork and two miles from the mouth of Trace, Mr. Fields has a four-yard wet entry giving the following at its mouth:

Hindman Coal.

Shale	10 ft.
Coal	67"
Clay	2"
Coal	7"
Clay	1"
Coal	42"
Altitude, 1660.	

The bed here has little covering, but westward the high hills toward the head of Lots creek offer a favorable field.

The following six sections represent openings into the Fire-clay coal on main Irishman creek and short branches between Trace fork and the forks at the school house, $2\frac{1}{2}$ miles up.

On the right of a right branch, $\frac{1}{8}$ mile above Trace

fork and a like distance up the branch, $\frac{7}{8}$ mile from Carr, Murray Combs has a five-yard entry, and on the left, one mile up the creek, Samuel Cook has a ten-yard entry. Their sections follow:

Fire-clay Coal.

Murray Combs.

Sandstone.	
Shale	3 ft.
Coal	24"
Black-jack	}
Flint clay	
Coal	12"
Black slate	2"
Coal	6"
Altitude, 1175.	

Samuel Cook.

Shale.	
Coal	24"
Black-jack	3"
Flint clay	3"
Coal	17"
Altitude, 1140.	

Water in the Cook entry prevented satisfactory examination of the bottom coal, but it is apparently all good.

On the right of a right branch, $1\frac{1}{4}$ miles up the creek, $\frac{1}{4}$ mile up the branch, 25 feet above it, Jack Madden has a five-yard wet entry, and on the right of the creek, $1\frac{5}{8}$ miles up it, Jack Asher has a fifteen-yard entry with the following sections:

Fire-clay Coal.

Jack Madden.

Massive sandstone	15 ft.
Cannel slate	2"
Coal	20"
Black-jack	3"
Flint clay	5"
Coal	13"
Bone coal	2"
Coal	4"
Clay.	
Altitude, 1175.	

Jack Asher.

Sandstone	20 ft.
Shale	4 ft.
Cannel slate	2"
Coal	19"
Black-jack	}
Flint clay	
Coal	11"
Slate	2"
Coal	4"
Altitude, 1135.	

BIG BRANCH is on the right of Irishman creek, $1\frac{7}{8}$ miles up. On its left, $\frac{1}{2}$ mile up is a six-yard entry with section given below.

MILL BRANCH is on the right, $2\frac{1}{8}$ miles up. P. Johnson has an entry on the left, $\frac{1}{4}$ mile up it.

Fire-clay Coal.

Big Branch	Mill Branch.
Sandstone 10 ft.	Shaly sandstone 10 ft.
Cannel slate 1"	Coal 26"
Coal 22"	Black-jack 1 to 5"
Black-jack 0 to 3"	Coal 12"
Flint clay 4"	Bone coal ?
Coal 12"	Altitude, 1170.
Bone coal 2"	
Coal 3"	
Altitude, 1180.	

In Big branch the Whitesburg bed is exposed under black slate, its thickness not known, its altitude 1,140.

On the right, 100 yards above Mill branch, John Madden has the Whitesburg bed opened at altitude 1,120 with 34 inches of coal under 3 feet of black slate and 10 feet of shaly sandstone. The upper 10 inches of coal has a considerable deposit of marcasite on its face. This is the only place in the field covered by this report where sulphur has been observed to any marked degree, and there are very few places where it is visible at all, either as marcasite or pyrite. Across the creek from this opening the same coal is 38 inches thick.

LEFT FORK.—At School No. 12, $2\frac{1}{2}$ miles up: Altitude of mouth, 1,064.

On the right of a left branch of this fork, $\frac{1}{8}$ mile up, Charles Madden has a four-yard wet entry into the Fire-clay coal. On the right, $\frac{1}{2}$ mile up the fork, the Fire-clay coal is opened and all strata are exposed up to and beyond the rider. Sections from these two places follow:

Fire-clay Coal, etc.

Left Branch.

Shale	5 ft.
Coal	24"
Black-jack	3"
Flint clay	4"
Coal	
Altitude, 1225.	

On Right.

Shaly sandstone	10 ft.
Shale	5 ft.
Coal	28"
Shale and coal	10"
Coal	4"
Shale	6 ft.
Coal	5"
Shale	2 ft.
Coal	5"
Shaly sandstone	8 ft.
Coal	26"
Black-jack	3"
Flint clay	3"
Coal	11"
Hard bottom.	
Altitude, 1200.	

At $\frac{3}{4}$ mile up the fork the Fire-clay coal goes below drainage: Altitude, 1,210.

On the left, one mile up, Bud Madden has a prospect which gives the following:

Flag Coal.

Sandstone	2 ft.
Shale	8 ft.
Block coal	41"
Shale	2"
Coal	1"
Clay.	
Altitude, 1530.	

On the left, in front of Samuel Pigman's house, $1\frac{3}{4}$ miles up, 10 feet above the fork, an incomplete prospect gives 20 inches of coal under 5 feet of shale, at altitude 1,310.

On the right of the road, 2 miles up the fork, $4\frac{1}{2}$ miles from Carr, Samuel Pigman has a closed entry into the Flag coal, probably over 4 feet thick, at altitude 1,550. A thick sandstone shows 10 feet above the bed and a 70-foot sandstone crowns the peak above it, which reaches an altitude of 1,900.

RIGHT FORK.—At $2\frac{1}{2}$ miles from Carr.

Alum Cave Branch is on the right of this fork, $\frac{1}{4}$ mile up it, and the altitude at its mouth is 1,160.

On the left, $\frac{1}{2}$ mile up the branch is a two-yard entry into 25 inches of coal with 3 inches of black slate covering it, on which is 5 feet of massive sandstone. The (exact) altitude of the bed is 1,205. It lies so near the level of the Fire-clay coal that the flint clay parting is to be expected in its floor.

On the right of the head of the branch, $1\frac{1}{4}$ miles up, John Madden has a ten-yard entry into the Flag bed at altitude 1,615. This gives 50 inches of clean coal with $1\frac{1}{2}$ feet of shale between it and the sandstone above. The broad bench of the Francis coal, 60 feet above the Flag bed, is prominent here.

On the right of the fork at the mouth of Alum Cave branch, 25 feet above it, at altitude 1,185 is a thin coal with fire-clay floor on 15 feet of shaly sandstone, and covering of 15 feet of shale under sandstone. This appears to be of the Whitesburg bed, but without the black slate roof the correlation is doubtful.

On the right of the fork, $\frac{3}{4}$ mile up it, $3\frac{1}{4}$ miles from Carr, Mrs. Madden has two entries with section as follows:

Fire-clay Coal.

Sandstone	5 ft.
Shale	1 ft.
Coal	28"
Parting	7"
Hard block coal	6"
Block coal	5"
Fire-clay	1 ft.
Shaly sandstone to creek	2 ft.
Altitude, 1200.	

The parting is of uniform thickness but variable in contents, the fire-clay being from 1 inch to 4 inches thick and the flint fire-clay from 6 inches to 3 inches. Bone coal was found 2 inches thick in the 28 inches of coal, 5 inches from the bottom, but it is not constant.

To the list of Flag coal openings on this creek must be added the Mullins 60 inches coal at the head of this fork and at altitude 1,590.

The Spencer Combs fifteen-yard wet entry on the left, $\frac{1}{8}$ mile above Irishman creek, at altitude 1,140 has the following section:

Fire-clay Coal.

Sandstone	5 ft.
Coal	26"
Flint clay	5"
Coal	8"
Clay	1"
Coal	8"
Altitude, 1140.	

LITTLE BRANCH.

On the right of Carr fork and $11\frac{1}{4}$ miles up it. Altitude of mouth, 985.

The only opening on this branch is the twelve-yard entry at altitude 1,190, now belonging to the Goodloe Brothers, given in Bulletin No. 11, page 103. A later measurement gives this as follows:

Fire-clay Coal.

Shale.	
Coal	34"
Black-jack	4"
Flint clay	5"
Coal	18"
Altitude, 1195.	

One or two inches of coal sticks to the black-jack in mining.

SMITH BRANCH.

On the right, $11\frac{3}{8}$ miles up Carr. Altitude of mouth, 985.

On the left of the first left fork, $\frac{3}{4}$ mile up it and $1\frac{1}{2}$ miles from Carr, Riley (or Hillard) Smith has two long entries in a rock-house, previously reported but with new measurements given here. On the right, $\frac{1}{4}$

mile up the second left fork and $1\frac{3}{4}$ miles from Carr, Riley Combs has a seven-yard entry with section as follows also:

Fire-clay Coal.

Smith Entry.	Combs Entry.
Sandstone 25 ft.	Sandstone 10 ft.
Shale 1 ft.	Coal 34"
Coal 33"	Black-jack 4"
Black-jack 4"	Flint clay 4"
Flint clay 3"	Coal 7"
Coal 17"	Bone coal 1"
Altitude, 1215.	Coal 2"
	Bone coal 1"
	Coal 7"
	Altitude, 1210.

No bone coal was detected in the Smith entry, but coal sticks to the black-jack as on Little branch, the one merging into the other by almost imperceptible changes. The shale changes to sandstone under cover.

On the left of Carr fork, 12 miles up it, Shade Smith has a prospect on the right of the easterly small branch by his house giving the following section:

Fire-clay Coal.

Sandstone.
Shale 5 ft.
Coal 28"
Black-jack 4"
Flint clay 4"
Coal 10"
Bone coal 4"
Coal 5"
Fire-clay 2 ft.
Sandstone 10 ft.
Altitude, 1190.

This opening is 200 feet above Carr and at or near this point a coal bed rises to creek level and continues with it for $1\frac{1}{2}$ miles or more up stream, and is the source from which the greater part of the coal supply of the vicinity is drawn. It is reported generally about

4 feet thick, 46 to 50 inches in one instance, and this is believed to be nearly correct. It is said to be without parting, but, in view of the partings found in the bed where it rises above the creek, this seems somewhat doubtful. Partings under water may escape discovery. Over this bed is about 50 feet of shale.

In previous reports this bed has been called the Elkhorn bed and came to be regarded as the equivalent of the Elkhorn coal now mined at McRoberts and Jenkins. This bed is really about 200 feet below the Elkhorn coal and to it is now given the entirely new name of "Amburgy" coal bed. Where in Bulletin No. 11, the Elkhorn coal is referred to 200 feet below the Fire-clay coal, this name Amburgy should be substituted, but this does not include the thick coal on Boone fork and elsewhere about the head of the river, which, like the Rockhouse coal, is 400 feet below the Fire-clay coal and is the true Elkhorn bed.

DEFEATED BRANCH.

On the right, $12\frac{3}{4}$ miles up Carr. Altitude of mouth, 1,000.

On the left, $\frac{1}{4}$ mile up a right branch, $\frac{1}{4}$ mile up Defeated branch, C. C. Hilton has a twenty-yard entry into the Fire-clay coal. Wet at the face, the measurement following was taken about half way in. On the left of a left drain, $13\frac{1}{4}$ miles up Mr. Hilton has another entry, barely under cover, into the same bed. Its section also follows:

Fire-clay Coal.

C. C. Hilton No. 1.		C. C. Hilton No. 2.	
Sandstone	3 ft.	Massive sandstone.	
Coal	20"	Coal	37"
Black-jack	3"	Black-jack	3 to 4"
Flint clay	4"	Flint clay	4 to 3"
Coal	13"	Coal	10"
Bone	3"	Bone coal	3"
Coal	4"	Altitude, 1310.	
Altitude, 1215.			

Two miles up the creek to the forks and up the right fork $\frac{1}{4}$ mile to a right branch and on the right, $\frac{1}{4}$ mile up this and 20 feet above it, C. C. Hilton's four-yard wet entry into the Fire-clay coal has the section following. A half mile up the left fork two miles up Defeated, $\frac{1}{8}$ mile up the left branch there, on the right of the trail to Breeding creek, Alamanda Blair has a twenty-yard entry into the same bed with section also following:

Hilton.		Fire-clay Coal.		Blair.	
Massive sandstone.				Sandstone.	
Shale	3 ft.			Coal	37"
Coal	4"			Black-jack	3"
Shale	7"			Flint clay	5"
Coal	40"			Coal	18"
Black-jack	3"			Altitude, 1360.	
Flint clay	4"				
Coal	6"				
Bone coal	2"				
Coal	4"				
Altitude, 1300.					

The bottom coal of the Blair entry may contain bone coal; it was not in condition for close inspection.

BREEDING CREEK (FORMERLY LITTLE CARR).

On the right, $12\frac{3}{4}$ miles up Carr. Altitude of mouth, 1,000.

On the right of a left branch, $\frac{3}{4}$ mile up Breeding creek, $\frac{1}{4}$ mile up the branch, James Bass has a wet entry into the Fire-clay coal with the following section:

Fire-clay Coal.	
Shale	5 ft.
Coal	32"
Black-jack	2"
Flint clay	4"
Coal	10"
Parting	1"
Coal	3"
Altitude, 1225.	

On the left, $1\frac{1}{4}$ miles up is the following exposure:

Shale	10 ft.
Block coal	4"
Splint coal	5"
Black slate	4"
Shale to creek	6 ft.
Altitude, 1045.	

Doubtless this includes a rider to the Amburgy coal bed, which then is probably not more than 10 feet below water level.

SUGAR BRANCH.—On the right, $1\frac{5}{8}$ miles up Breeding creek. Altitude of mouth, 1,090.

On the left of a right drain, $\frac{1}{4}$ mile up the branch, is John Buck's five-yard entry into the Fire-clay coal, given in Bulletin No. 11. Following is a corrected section:

Fire-clay Coal.

Shaly sandstone.	
Coal	32"
Flint clay	5"
Coal	12"
Altitude, 1295	

On the left at the branch, $\frac{3}{4}$ mile up it, Jesse Amburgy has a two-yard entry into the same bed at altitude 1,305, with like section but with 2 inches of black-jack on the flint clay and 34 inches of coal above that.

MALLET FORK.—On the right, $1\frac{3}{4}$ miles up Breeding creek. Altitude of mouth, 1,100.

On the right, $\frac{1}{8}$ mile up the fork, at water level, the rider to the Amburgy coal shows 8 inches thick under 20 feet of shale at altitude 1,120. On the hill opposite this, John Hale has a twenty-five-yard entry into the Fire-clay coal. On the right of a left branch of Mallet fork, $\frac{1}{4}$ mile up it and the same distance up the branch, William Hale has an opening into the same bed. Sections of these two openings follow:

Fire-clay Coal.

John Hale.		William Hale.	
Sandstone	20 ft.	Sandstone	5 ft.
Coal	27"	Coal	32"
Bony coal	4"	Bony coal	3"
Flint clay	4"	Flint clay	5"
Coal	12"	Coal	12"
Altitude, 1315.		Altitude, 1350.	

On the left of a left branch, $\frac{1}{2}$ mile up Mallet fork, $\frac{1}{8}$ mile up the branch, Noah Gent has a twenty-yard entry. On the left at the head of Mallet fork, one mile up it, Daniel Adams has a twenty-yard entry at altitude 1,305, which if nearly correct, as it probably is, gives a reverse dip at the head of this fork. Sections from these two Fire-clay coal entries follow, the Gent section varying somewhat from that previously reported:

Fire-clay Coal.

Gent.		Adams.	
Sandstone	8 ft.	Sandstone	10 ft.
Coal	30"	Coal	30"
Bony coal	1"	Black-jack	4"
Flint clay	4"	Flint clay	4"
Coal	12"	Coal	9"
Altitude, 1340.		Altitude, 1305.	

LEFT FORK.—Two and one-quarter miles up Breeding. Altitude of mouth, 1,150.

On the left branch, $\frac{3}{4}$ mile up this fork, on the left, $\frac{1}{8}$ mile up it, Harlan Williams has a four-yard entry, and on the right of a drain on the left, $\frac{7}{8}$ mile up the fork, Fraser Adams has one of 12 yards. Both are in the Fire-clay coal and they gave the following sections:

Fire-clay Coal.

Williams.		Adams.	
Sandstone	4 ft.	Shaly sandstone	10 ft.
Coal	29"	Shale	2 ft.
Black-jack	2"	Cannel slate	2"
Flint clay	4"	Clay	1"
Coal	9"	Coal	25"
Altitude, 1380.		Black-jack	1"
		Flint clay	5"
		Coal	10"
		Altitude, 1400.	

In a left drain one mile up, an old opening gives the bed's altitude at 1,415 and at $1\frac{1}{8}$ miles up, where it goes below drainage, it is 1,425. This rapid rise of strata is made evident also in their exposure along the stream.

On the left of a left branch, $2\frac{3}{8}$ miles up the creek, $\frac{1}{4}$ mile up the branch, George Breeding has a twelve-yard entry, and on a right branch, $2\frac{3}{4}$ miles up Breeding creek, on the right, $\frac{1}{8}$ and $\frac{1}{4}$ miles up the branch, William Breeding has three-yard and ten-yard entries. These three Fire-clay coal entries give the following, respectively:

Fire-clay Coal.

Sandstone	10 ft.	5 ft.	7 ft.
Shale	4 ft.	none	none
Coal	27"	25"	28"
Flint clay	5"	6"	6"
Coal	7"	11"	12"
Altitude, 1350.		1390	1400

The flint fire-clay of the first of these is black, of the second both brown and black and of the third brown only.

On a left branch 3 miles up Breeding creek, on the right, $\frac{1}{4}$ mile up it, beside the road to Wolf-Pen branch, William Johnson has a long entry, and on the right, $3\frac{1}{2}$ miles up, beside the road to Rockhouse creek, $\frac{1}{8}$ mile from the gap, James Breeding has one also. Sections of these two Fire-clay coal openings follow:

Fire-clay Coal.

Johnson.		Breeding.
Thin-bedded sand-		Sandstone
stone	5 ft.	5 ft.
Black slate	4"	Shale
Clay	11"	6 ft.
Coal	27"	Cannel coal
Flint clay	6"	1"
Coal	12"	Coal
Altitude, 1390.		25"
		Flint clay
		6"
		Coal
		12"
		Altitude, 1395.

The latter entry is but 85 feet below the gap to Rockhouse creek, but the hills are high enough to give the bed large area.

In a left branch, $13\frac{1}{2}$ miles up Carr fork, $\frac{1}{8}$ mile up the branch, Samuel Francis has a pit from which apparently 30 inches of good block coal is taken, but the lower half being hidden in water, was not seen in place. With an altitude of 1,115, it is probably of the Whitesburg bed, though, being about 70 feet under the Fire-clay coal, the interval is large for that correlation. The rock covering was not seen and cannel coal and slate may cover the bed as they do on Little Carr not far distant.

The Fire-clay coal is opened on the same branch, on the right, $\frac{1}{4}$ mile up it, where a six-yard entry gives the following:

Fire-clay Coal.

Sandstone	8 ft.
Shale	1 ft.
Coal	30"
Black-jack	3"
Flint clay	4"
Coal	10"
Shale	5"
Coal	4"
Altitude, 1190.	

On the right, 14 miles up Carr, Henry Blair has a two-yard entry, 3 feet above the creek, into the Amburgy coal, which here makes its first appearance above water level. The following section was obtained here:

Amburgy Coal.

Shale	5 ft.
Coal	3"
Shale	10 ft.
Coal	2"
Shale	6"
Coal	1"
Shale	3"
Coal	38"
Black slate	2"
Fire-clay	2 ft.
Sandstone in creek.	
Altitude, 1010.	

The bed is at creek level 100 yards farther up. At $14\frac{1}{8}$ miles up, a prospect into this bed gives 37 inches of coal with an inch of black slate 3 inches from the top. At the mill, $14\frac{1}{4}$ miles up, 30 to 40 feet of shale are exposed over the coal with massive sandstone above the shale. On the left of the creek and road, $15\frac{1}{8}$ miles up Carr, the bed gives the following section:

Amburgy Coal.

Shale	5 ft.
Coal	1"
Shale	10"
Coal	3"
Slate	2"
Coal	34"
Shale	1"
Coal	3"
Altitude. 1030.	

On the right, $15\frac{1}{4}$ miles up Carr (below Little Carr) this bed has in its main seam only 27 inches of coal under 3 feet of shale and then 5 feet of sandstone. This massive sandstone can be seen for a mile down the creek, about 10 feet above the coal, but farther down its place is occupied by shale. Beside this entry a rider appears to start from the coal. It is a continuous feature farther up the creek.

A quarter mile to the left, $15\frac{1}{4}$ miles up Carr fork opposite the mouth of Little Carr, Andrew Combs has an abandoned prospect into cannel coal at altitude, 1,155, from which blocks a foot thick were taken. The place was abandoned because unsuitable for opening rather than because of thin coal. An entry into the bed has been made a half mile up Little Carr.

LITTLE CARR (FORMERLY AMBURGY BRANCH).

On the right, $15\frac{1}{4}$ miles up Carr fork. Altitude of mouth, 1,020.

On the right, $\frac{1}{4}$ mile up, H. H. Amburgy has a twelve-yard wet entry, 15 feet above the creek, from which the following was obtained:

Amburgy Coal.

Shale	10 ft.
Coal	15"
Shale	1 ft.
Black slate	1"
Coal	2"
Shale	2"
Coal	36"
Altitude, 1045.	

On the right of a left branch, $\frac{1}{2}$ mile up Little Carr, $\frac{1}{8}$ mile up the branch, Floyd Taylor has a ten-yard entry into the Whitesburg bed about 50 feet under the Fire-clay coal. Its section is:

Whitesburg Coal.

Shale	10 ft.
Cannel slate	12"
Cannel coal	6"
Block coal	6"
Slate and pyrite	1"
Block coal	37"
Altitude, 1200.	

The block coal is particularly bright and rich-looking; the 6 inches of cannel looks very good but its weight betrays a large amount of ash. There is no definite plane of change from the cannel to the coal below or to the slate above it, one merging into the other.

On the right, $1\frac{1}{4}$ miles up Little Carr, a long exposure of cliff with entries 5 feet above the creek, gives:

Amburgy Coal.

Shale	15 ft.
Coal	12"
Shale with calcareous concretions	$2\frac{1}{2}$ to 4 ft.
Coal	2"
Shale	8"
Coal	30"
Shale	1"
Coal	4"
Shale and coal	5 ft.
Thin-bedded sandstone in creek.	
Altitude, 1070.	

WOLF-PEN BRANCH.—On the right, $1\frac{1}{2}$ miles up Little Carr. Altitude of mouth, 1,075.

On the right, $\frac{1}{8}$ mile up the branch and 3 feet above it is the following in outcrop:

Amburgy Coal.

Shaly sandstone	5 ft.
Coal	1"
Shale	1"
Coal	2"
Shale	12"
Coal	28"
Bony coal	2"
Shale	1"
Coal	9"
Altitude, 1090.	

Coal in the branch, $\frac{1}{4}$ mile up, altitude 1,120, is probably of the rider, not seen in the preceding section.

On the right, $\frac{1}{4}$ mile up Leek branch, which is on the right, $1\frac{1}{4}$ miles up Wolf-Pen, B. F. Hammond has an opening into the Fire-clay coal. On the right of Wolf-Pen, $1\frac{1}{2}$ miles up, Joseph Raleigh has a ten-yard entry, into the same bed, 140 feet above the creek. The sections at these two places are:

Fire-clay Coal.

Hammond.

Sandstone	5 ft.
Coal	26"
Flint clay	4 to 6"
Coal	12"
Altitude, 1380.	

Raleigh.

Shale	6 ft.
Coal	29"
Flint clay	6"
Coal	12"
Altitude, 1400.	

On the right, $1\frac{3}{4}$ miles up Wolf-Pen, Tandy Amburgy has a twenty-five-yard entry with the following section, measured at the face:

Fire-clay Coal.

Shale	8 ft.
Coal	32"
Black-jack	6"
Cannel coal	24"
Altitude, 1395.	

The impression prevails that this is the same bed that is opened into cannel coal near the mouth of Little Carr (the Whitesburg bed), and its altitude, as obtained, is indicative of that bed, but the cannel in this entry is at the bottom of the bed, whereas in the other it is at the top, and the usual black slate covering of the Whitesburg bed is wanting. Moreover the parting, though not the almost invariable accompaniment of the Fire-clay coal, the brown flint fire-clay, is just such a compound of fire-clay and black slate as is found at nearly every opening of the Fire-clay coal bed on Carr fork waters, and never but once anywhere, by the writer, in the Whitesburg bed. The conclusion then is that this is of the Fire-clay coal and that either the barometric altitude is incorrect, or a reversal of the up-stream rise of strata occurs on the head of Wolf-Pen. No reversal has been found elsewhere on Little Carr.

The cannel of this opening is fine-looking and light in weight. Samples of both the bituminous coal and cannel, taken by Professor Crandall for the Survey, gave the following results:

	Fire-clay Coal.	
	Bituminous.	Cannel.
Moisture	5.46	0.26
Volatile combustible matter	31.68	47.94
Fixed carbon	57.46	44.86
Ash	5.40	6.94
Sulphur	0.488	0.751
Specific gravity	1.385	.....

The cannel is said to be explosive in burning.

Across the divide at the head of Wolf-Pen, on the head of Stamper branch of Rockhouse creek, about a mile east of the preceding, Cordelia Hammond has a closed entry in which is over 5 feet of block and splint coal (probably including 2 inches of slate found in the dump); its altitude 1,940.

This is probably of the Hindman bed, quite possibly the 77 inches coal with 4 inches parting given in Bulletin No. 11, page 108, as no other such opening was found in the vicinity. It indicates nearly level strata from the cannel opening on Wolf-Pen. Being 100 feet

above the Wolf-Pen gap, with little area, its value lies only in local use.

On the right, two miles up Little Carr is a twelve-yard entry, 3 feet above the creek, where the following section was obtained, the lower seams measured half way in:

Amburgy Coal.

Sandstone	5 ft.
Shale	20 ft.
Coal	5"
Shale	12 ft.
Coal	3"
Shale	20"
Coal	3"
Shale	1"
Coal	30"
Altitude, 1115.	

LITTLE DOUBLE BRANCH.—On the right, $2\frac{3}{8}$ miles up Little Carr. Altitude of mouth, 1,125.

The three sections following give, respectively, the only openings now on this branch. The first is on the right of a left drain, $\frac{1}{8}$ mile up the branch, Jesse Pigman's eight-yard wet entry; the second is on the right, $\frac{3}{8}$ mile up, Jack Hammond's wet entry; and the third is on the left, $\frac{3}{4}$ mile up, William Ward's entry:

Fire-clay Coal.

Pigman.	Hammond.	Ward.
Sandstone 10 ft.	 5 ft.	.....
Shale 3 ft.	 0	10 ft.
Coal 30"	32"	32"
Black-jack 3"	 3"	 6"
Flint clay 4"	 4"	 0
Bone coal 0	 0	 1"
Coal 11"	13"	 9"
Altitude, 1380	1390	1400

It is to be noted that in the third section, nearest to the cannel coal on Wolf-Pen, the flint fire-clay is absent, as in the cannel opening.

BIG DOUBLE BRANCH.—On the right, $2\frac{1}{2}$ miles up Little Carr. Altitude of mouth, 1,130.

On the left at the mouth of the branch a prospect gives the following:

Amburgy Coal.

Shale.	
Coal.	
Shale	3 ft.
Block coal	26"
Slate	2"
Coal	2"
Altitude, 1150.	

The three sections given next are, respectively, first, from $\frac{1}{4}$ mile up a left branch, $\frac{3}{8}$ mile up Big Double branch, Andrew Case's seven-yard entry; second, from the left of a left drain, $\frac{1}{8}$ mile up it, $\frac{1}{2}$ mile up Big Double, Jefferson Amburgy's six-yard entry; third, from on the right, across the hollow from the second, 80 yards southeast of it, W. F. Amburgy's twenty-five-yard entry.

Fire-clay Coal.

Case.	J. Amburgy.	W. F. Amburgy.
Sandstone 1 ft.	 1 ft.	.....
Shale 8 ft.	 0	 2 ft.
Coal 34"	 32"	 37"
Flint clay 6"	 6"	 5"
Coal 12"	 9"	 8"
Altitude, 1385	1350	1370

Jenny Lewis branch is on the left, $\frac{3}{4}$ mile up Big Double. On the right of the branch $\frac{1}{4}$ mile up it, Jasper Amburgy has a twenty-five-yard entry, its section following.

On the left of the right fork of Big Double at its head, $1\frac{1}{2}$ miles from its mouth, Lindsey Amburgy has a fifteen-yard entry with the section following:

Fire-clay Coal.

Jasper Amburgy.		Lindsey Amburgy.	
Shale	10 ft.	Shaly sandstone	6 ft.
Coal	34"	Coal	34"
Flint clay	2"	Bony coal	2"
Coal	5"	Flint clay	6"
Altitude, 1375.		Coal	6"
		Altitude, 1410.	

On the right of Little Carr, $2\frac{5}{8}$ miles up it, $\frac{1}{8}$ mile above Big Double, the Amburgy bed shows, at altitude 1,145, 10 feet above the creek, 30 inches of coal with a knife-edge of shale 3 inches from the top.

STILLHOUSE BRANCH.—On the left, $2\frac{3}{4}$ miles up Little Carr. Altitude of mouth, 1,145.

The Whitesburg coal shows its covering in a thick bed of black slate up this branch, the coal under it, reported two feet thick, one-half mile up, being at altitude 1,285.

Above the preceding, George Gibson has an eight-yard wet entry, the main coal seam reported about 28 inches thick with parting and lower coal each about 4 inches. Two feet of shale and then 5 feet of sandstone overlie it. This is of the Fire-clay coal bed, at altitude 1,385.

The top seam of the Amburgy coal goes under the creek at the mill, 3 miles up Little Carr, at altitude, 1,185.

LEFT FORK.—On the left, $3\frac{3}{8}$ miles up Little Carr.

There are two entries into the Whitesburg bed, each $\frac{1}{4}$ mile up this fork and at altitude 1,355, one on the left, the J. W. Collins eight-yard entry, having 38 inches of coal under 10 inches of black slate, the other on the right, the Nancy Gent five-yard wet entry, having 34 inches of coal under 3 feet of black slate.

The Fire-clay coal is opened on the right, $\frac{3}{4}$ mile up the fork, in Tandy Martin's five-yard wet entry, at altitude 1,430. More than $2\frac{1}{2}$ feet of coal was visible, under 3 inches of black slate and 20 feet of shale, in the middle of which is $1\frac{1}{2}$ feet of sandstone. This thin sandstone shows in shale or earth over the Fire-clay coal at several places in this vicinity.

RIGHT (MAIN ROAD) FORK.—On the right, $3\frac{3}{8}$ miles up Little Carr.

On the right of the fork, $\frac{1}{4}$ mile up it, Robert Collins has a fifteen-yard wet entry at altitude 1,450, showing 38 inches of the main seam of the Fire-clay coal under 10 feet of shale. Nine inches more coal is reported under the parting below. In the point of the hill on the way up to this entry the black slate of the Whitesburg bed crops out at altitude 1,385.

On the left, $\frac{3}{4}$ mile up this fork, Charles Logan has a fifteen-yard entry into the Fire-clay coal at altitude 1,450, having 34 inches of coal under 2 inches of black slate, then 6 feet of shaly sandstone and then 3 feet of massive sandstone. The dump gave black, flint fire-clay about 6 inches thick.

The Amburgy coal bed continues up Carr fork slightly above the stream. A section of the bed as exposed beside the road, on the left, $\frac{1}{8}$ mile above the mouth of Little Carr, is given, with analyses, in Bulletin No. 11, pages 105 and 106. Its altitude is exactly 1,030.

BETTY TROUBLESOME.

On the left, $15\frac{3}{4}$ miles up Carr fork. Altitude of mouth, 1,030.

DICE'S (STILLHOUSE) BRANCH.—On the left, $\frac{1}{8}$ mile up Betty Troublesome.

On the right, $\frac{3}{4}$ mile up this branch, W. F. Bentley has a six-yard entry with the following section:

Fire-clay Coal.

Shale	5 ft.
Coal	28"
Flint clay	3"
Coal	7"
Bone coal	2"
Coal	9"
Black slate	3"
Altitude, 1195.	

DEADMAN'S BRANCH.—On the right, $\frac{1}{4}$ mile up Betty Troublesome.

On the left, $\frac{3}{4}$ mile up the branch, 10 feet above it,

a foot of the coal of the Whitesburg bed is exposed, under 3 feet of black slate, but no attempt to open it has been made. Its altitude is 1,180.

Thirty feet higher about the same thickness of the Fire-clay coal outcrops, altitude 1,210.

On the left, $\frac{1}{4}$ mile up a left branch, $\frac{7}{8}$ mile up Betty Troublesome, Jefferson Hall has a wet entry from which the following was obtained:

Fire-clay Coal.

Shale	3 ft.
Coal	26"
Black-jack	4"
Flint clay	3"
Coal	10"
Black slate	3"
Altitude, 1210.	

The bottom coal and slate measure 13 inches; the proportion given of each may be slightly erroneous.

TURKEY-PEN BRANCH.—On the left, 1 mile up Betty Troublesome. Altitude of mouth, 1,088.

On the right, $\frac{1}{4}$ mile up a left branch, $\frac{1}{4}$ mile up Turkey-Pen, Noah Reynolds has a wet entry but with an exceptionally good opportunity to measure the bed at the outcrop.

On the left $\frac{3}{4}$ mile up Turkey-Pen, 20 feet above it, Reuben Amburgy (or Nicholas Combs) has a ten-yard entry. Their sections follow:

Fire-clay Coal.

Reynolds.		Reuben Amburgy.	
Shale	2 ft.	Sandstone.	
Coal	6"	Shale	3 ft.
Shale	6 ft.	Coal	28"
Coal	26"	Black-jack	4"
Black-jack	6"	Flint clay	2"
Flint clay	3"	Coal	14"
Coal	1"	Altitude, 1220.	
Bone coal	1"		
Coal	11"		
Altitude, 1180.			

In the central peak at the head of Turkey-Pen, $1\frac{1}{4}$ miles from its mouth, Marion Tolliver has an entry into the Flag coal, at altitude 1,625, giving 54 inches of fine, bright block coal, the lower half hard, under $1\frac{1}{2}$ feet of shale and 4 feet of sandstone. The area of the bed here is very small.

An attempt was made in former prospecting to get a full section of the coals on the right, $1\frac{1}{4}$ miles up Betty Troublesome, at Leander Parks'. Following are the results obtained from recent examination there: The openings were made so nearly over one another that dip may be disregarded.

	Altitude.
High peak	1865
Prospect, 2 feet coal seen, reported 88 inches.....	1675
Prospect, $2\frac{1}{2}$ feet coal seen, reported 62 inches.....	1630
Prospect, covered coal, probably thin	1325
Prospect, Fire-clay coal rider	1270
8-yard entry—Fire-clay coal (in full below).....	1240
Prospect—Whitesburg coal, $1\frac{1}{2}$ feet	1210
Creek	1120

The Whitesburg bed is recognized by its 4 feet of black slate covering, over which is shaly sandstone.

The Fire-clay coal bed has 28 inches of coal in its main seam, and bottom coal of about 13 inches, with black-jack and flint fire-clay parting of only 5 inches. Three feet of shale is exposed over the entry. The rider appears to be thin.

The two high beds of the section are believed to be of the Flag and Hindman beds with a possible error in altitude of the latter to account in part for the proximity of the two. If such is the case the interval from the Fire-clay coal to the Flag, 390 feet, corresponds nearly with results obtained heretofore.

The higher coal still has covering enough over it to admit of mining a fairly good area in this ridge, and nowhere else is so large an area of this coal so near to a large stream and consequently fairly accessible.

On the right of a right branch, $1\frac{1}{4}$ miles up Betty Troublesome, $\frac{1}{8}$ mile up the branch, Silas Martin has an eight-yard entry into the Fire-clay coal and a five-

yard wet entry into the Whitesburg bed 40 feet lower. The sections of these follow:

Fire-clay Coal.		Whitesburg Coal.	
Sandstone	2 ft.	Shale	5 ft.
Shale	2 ft.	Coal	1"
Coal	30"	Shale	2"
Black-jack	5"	Coal	4"
Flint clay	2"	Shale	2"
Coal	12"	Coal	22"
Altitude, 1240.		Shale	1"
		Coal	5"
		Altitude, 1200.	

The total thickness of the Whitesburg bed measures 41 inches, leaving four inches at the bottom which may be additional coal, but could not be determined in the deep water.

On the left of a right branch, $1\frac{3}{4}$ miles up Betty Troublesome, $\frac{1}{8}$ mile up the branch, Thomas Hall has ten-yard and four-yard entries into the Fire-clay and Whitesburg coals, with the sections following:

Fire-clay Coal.		Whitesburg Coal.	
Sandstone	5 ft.	Sandstone	15 ft.
Sandy shale	6 ft.	Shale	1 ft.
Coal	30"	Coal	1"
Black-jack and flint clay..	6"	Shale	1 to 6"
Coal	10"	Coal	6"
Altitude, 1260.		Shale	1"
		Coal	24"
		Shale	6"
		Coal	6"
		Altitude, 1230.	

Nicholas Combs has a closed entry into the Whitesburg bed, $2\frac{1}{4}$ miles up the creek, at altitude 1,220. The Fire-clay coal shows above it at 1,250.

On the left, $2\frac{1}{2}$ miles up, is a four-yard wet entry into the Fire-clay coal at altitude 1,245, having in its main seam 29 inches of coal and about 9 inches coal under a parting of 8 inches black-jack and flint clay. Eight feet of shale is exposed above it.

In the peak at the head of the creek, three miles

from its mouth, Jasper Amburgy has a one-yard entry with the following section:

Flag Coal.

Shale	10 ft.
Coal	46"
Black slate	5"
Coal	8"
Altitude, 1650.	

The broad top of the ridge about 60 feet lower is due to the cliff sandstone under the Hazard coal bed.

On the left of the road and of Carr fork, 16½ miles up and 20 feet above it, at altitude 1,055, the Amburgy bed has been driven under cover with top coals and partings substantially the same as follow in the section below and bottom seam of coal half covered. On the left by the road, 16¾ miles up Carr, this section was obtained:

Amburgy Coal.

Shale	10 ft.
Coal	9"
Shale	9"
Coal	2"
Shale	4"
Coal	34"
Shale to creek at 1040.	
Altitude, 1055.	

On the right, 16⅞ miles up Carr, J. E. Stamper has an opening into the same bed at altitude 1,080, showing about 2½ feet of coal at the bottom, 16 inches parting and 3 inches more of coal at the top, with 8 feet of shaly sandstone above it.

BUCKEYE BRANCH.

On the right, 17 miles up Carr. Altitude of mouth, 1,045.

On the right, ½ mile up the branch, J. E. Stamper has a six-yard entry into the Fire-clay coal at altitude 1,280. The main seam is 30 inches thick and that only

has been mined. The flint clay parting is 5 inches or more thick and 8 inches of coal is reported under it. Three feet of sandstone covers the bed.

On the left, $17\frac{1}{8}$ miles up Carr, and on the right of the branch at Spider postoffice, John Banks has an eight-yard entry into the Amburgy coal at altitude 1,085, with 30 to 32 inches of coal under 12 inches of shale and with 2 inches of coal above that and 20 feet of cliff sandstone overlying the bed. The change from the long series of exposures of apparently true clay shales, found below on the creek, to this massive sandstone is very striking. A quick return to the shale follows.

SMITH BRANCH.

On the left, $17\frac{1}{4}$ miles up Carr. Altitude of mouth, 1,055.

On the right, $\frac{1}{8}$ mile up this branch, an eight-yard entry gives the following:

Amburgy Coal.

Shale	3 ft.
Coal	3"
Shale	2 ft.
Coal	25"
Black slate	2"
Altitude, 1075.	

A little coal may be under the slate, the bottom not having been seen.

On the left of a left branch, $\frac{1}{2}$ mile up Smith branch, $\frac{1}{8}$ mile up the left branch, Benton Stampers has a two-yard entry into the Whitesburg coal and a twelve-yard entry into the Fire-clay coal rider. Sections of these follow:

Whitesburg Coal.

Shale	4 ft.
Black slate	$1\frac{1}{2}$ ft.
Coal	22"
Altitude, 1240.	

Fire-clay Coal Rider.

Shale	
Coal	5"
Shale	$\frac{1}{4}$ to 1"
Coal	27"
Slate	2"
Coal	4"
Altitude, 1290.	

The slate in the rider is soft with contained coal and may be but little deleterious.

On the same left branch, $\frac{1}{4}$ mile up it, Mr. Stampers has a six-yard wet entry into the Fire-clay coal at altitude 1,290, on the level of the preceding rider coal opening. This entry shows about 40 inches of coal, probably including 2 inches of black-jack found in the dump. A foot of shale covers the coal, on which is sandstone in a slight roll which appears not to have affected the coal.

On the right of a left branch, $1\frac{1}{2}$ miles up Smith branch, from $\frac{3}{8}$ to $\frac{5}{8}$ mile up the left branch, on Ezekiel Caudill's land, three beds show within 50 feet vertically. These are the Whitesburg, at altitude 1,205, with 24 inches of coal under 3 feet of black slate, in a slip which may not show all of the coal; the Fire-clay coal in a fifteen-yard entry, and the rider in a four-yard entry. The last two give:

Fire-clay Coal.	
Shale	4 ft.
Coal	28"
Flint clay	4"
Coal	11"
Altitude, 1235.	

Fire-clay Coal Rider.	
Shale	6 ft.
Coal	5"
Shale	1"
Coal	25"
Black slate	3"
Coal	2"
Black slate	1"
Coal	9"
Altitude, 1250.	

The bottom seam of the Fire-clay coal is a good hard block with one inch splinty; the top is especially noted here as having no cleavage planes, generally absent in Carr fork openings.

On the right, $1\frac{7}{8}$ miles up Smith branch, Robert Pigman has a ten-yard entry into the Fire-clay coal rider, and two miles up, a six-yard entry into the same bed. Sections of these two entries follow:

Fire-clay Coal Rider.

10-yard entry.

Shale	3 ft.
Coal	2"
Clay	½ to 2"
Coal	5"
Clay	1"
Coal	40"
Black slate	5"
Coal	5"
Altitude, 1260.	

6-yard entry.

Sandstone.	
Shale	4 ft.
Cannel slate	2"
Shale	3"
Coal	30"
Black slate.	
Altitude, 1285.	

On the right, $2\frac{1}{8}$ miles up, the top of the Whitesburg bed, at altitude 1,250, shows a foot of coal under 4 feet of black slate.

The bed with the two entries is correlated as the rider because of the similarity of these sections with those in this bed farther down the branch, and the Whitesburg bed because of its black slate roof. There seems to be no room for doubt in this, though it leaves little space for the intermediate Fire-clay coal.

At the head of the branch, $2\frac{1}{2}$ miles up, and opposite the head of Sams branch, L. Merkins has a five-yard entry with the following section at its face:

Flag Coal.

Shale.	
Coal about	48"
Shale	5"
Coal	10"
Altitude, 1630.	

By the road, on the left, $18\frac{1}{4}$ miles up Carr, at the mouth of an entry, and again on the left, $18\frac{3}{4}$ miles up Carr, in J. W. Reedy's eight-yard entry, the following sections were obtained:

Amburgy Coal (J. W. Reedy).

Shale	6 ft.	.....	10 ft.
Coal	2"	.....	0
Shale	34"	.....	0
Coal	28"	.....	26"
Black slate	1"	.....	2"
Clay	0	.....	1"
Coal	3"	.....	2"
Altitude, 1080.		1095	

These sections are particularly remarkable in showing a close resemblance to the Fire-clay coal rider on Smith branch, a bed 200 feet higher in the series of the strata.

The coal showing in the road opposite the mouth of Deer fork lies about 30 feet below the Amburgy bed.

DEER FORK.

On the right, 19 miles up Carr. Altitude of mouth, 1,065.

On the right, $\frac{1}{4}$ mile up this fork, is a coal about one foot thick, under shale, at water level and altitude 1,075.

On the left, $\frac{3}{8}$ miles up, Mrs. Mary Amburgy has a six-yard entry with the following section:

Amburgy Coal.

Massive sandstone	15 ft.
Coal	 6"
Shale	 1"
Coal	18"
Black slate	 2"
Coal	 2"
Altitude, 1095.	

Fifteen feet of thin-bedded sandstone down to the creek, underlies the bottom clay of this opening. Again there is a change of covering to massive sandstone, which continues till it goes below drainage a half mile farther up this fork.

At $\frac{5}{8}$ mile up is a left branch with mouth at altitude 1,125. On the left of this, $\frac{1}{8}$ mile up it, Hiram Pratt has a ten-yard wet entry with the following section:

Fire-clay Coal Rider.

Sandstone	 3 ft.
Shale	 2 ft.
Coal	 1"
Shale	 3"
Coal	 4"
Shale	 3"
Coal	23"
Shale	 1"
Coal	22"
Altitude, 1350.	

Other openings into this or adjacent beds have been made on this fork, but none were in condition to measure when visited. Strata rise rapidly up stream.

On a right branch, $\frac{1}{2}$ mile up and on the left of the branch and road to Little Carr, $\frac{1}{8}$ mile from the gap, $1\frac{1}{4}$ miles from Carr fork, is Seymour Amburgy's thirty-yard entry into 37 inches of the main seam of the Fire-clay coal bed, at altitude 1,375. The floor is black-jack and a foot of coal is reported under the parting. Ten feet of shaly sandstone is exposed over the entry.

On the right, $1\frac{1}{4}$ miles up Deer fork, W. B. Smith has a wet entry into the Whitesburg bed, at altitude 1,375, having 37 inches of clean coal under 5 feet of shale.

Above the preceding is an eight-yard entry with the following section:

Fire-clay Coal.

Shaly sandstone.	
Shale	2"
Coal	5"
Shale	1"
Coal	15"
Mother coal	$\frac{1}{4}$ "
Coal	12"
Flint clay	5"
Coal	9"
Altitude, 1405.	

This entry has been abandoned in favor of the one below it. The flint fire-clay here is black instead of the usual brown.

On the left of a left branch 20 miles up Carr. $\frac{1}{4}$ mile up the branch, George Kelly has an opening into the Fire-clay coal, probably, at altitude 1,300, giving 32 inches of coal on a black-jack or black slate floor and under 5 feet of shale.

BRANHAM CREEK.

On the left $19\frac{3}{4}$ miles up Carr: Altitude of mouth, 1,085.

On the right at Ambrose Amburgy's, $\frac{1}{8}$ mile up

the creek is an opening into the Amburgy bed at altitude, 1,115 which is duplicated in the following section from a four-yard entry at altitude 1,125, on the left of a right branch $\frac{1}{4}$ mile up the creek. The section is:

Amburgy Coal.

Sandstone	10 ft.
Coal	4"
Black slate	1"
Coal	20"
Black slate	1"
Coal	3"
Altitudes, 1115 and 1125.	

Ten feet of massive sandstone underlie this coal, and under that is 15 feet of shale carrying bastard limestone boulders.

On the left, $\frac{1}{2}$ mile up, Wiley Tolliver has an eight-yard wet entry into the Fire-clay coal or rider as given in the section following:

Fire-clay Coal Rider.

Shale	5 ft.
Black slate	2"
Clay	1"
Coal	41"
Black slate	3"
Altitude, 1340.	

The black slate floor, the bottom of which was not reached, seems to fix the bed as of the rider, and the coal itself has a more defined cleavage than the Fire-clay coal usually shows in this field. The two inches at the top is somewhat slaty.

On a left branch, $\frac{1}{2}$ mile up, $\frac{1}{8}$ mile up the branch, Isom Sloane had just started an entry at the time of an early visit, where the following section was obtained:

Fire-clay Coal Rider

Shaly sandstone	1 ft.
Coal	40"
Bone Coal	7"
Shale	14"
Coal	7"
Altitude, 1295.	

Five thin partings included in the upper seam were expected to disappear underground. The thickness of coal tends to correlation of this opening with the preceding notwithstanding that the altitude obtained indicates it as of the Fire-clay coal bed. A bed once opened 25 feet under this and reported three feet thick, is probably the latter, though the presence of black slate in the dump is rather indicative of the Whitesburg bed.

BENTLEY FORK.—On the left, $\frac{3}{4}$ mile up Branham creek: Altitude of mouth, 1,125.

In the branch at its mouth is a coal, probably thin, under 30 feet of shale.

On the left of a left hollow, $\frac{1}{2}$ mile up, John Bentley has a closed entry at altitude 1,285, showing a coal bed 3 to 4 feet thick under thin black slate as in the Tolliver entry just preceding. Eight feet of shale and a foot of sandstone overlie the slate. The same covering is exposed over an abandoned entry, at altitude 1,265, on the right at the head of the fork, $\frac{5}{8}$ mile up it.

On the left, $\frac{7}{8}$ mile up Branham, Washington Francis has a closed entry into a three-foot coal bed with 10 feet of sandy shale above it, at altitude, 1,330. This is probably of the Fire-clay coal, the rider showing in an old prospect 20 feet above it.

WALNUT FORK.—On the left $1\frac{3}{8}$ miles up Branham: Altitude of mouth, 1,160.

On the left of this fork, $\frac{1}{4}$ mile up it, Lewis Cook has two entries, at altitude 1,325, into clean coal 48 inches thick at the mouth, 45 inches 8 yards in, on a

foot of common fire-clay and under 15 feet of sandstone. Its altitude is indicative of the Fire-clay coal bed, but with other beds close to it this is quite uncertain.

On the left, $\frac{1}{2}$ mile up, Nathaniel Bentley has a four-yard entry into the Fire-clay coal, at altitude 1,345, giving 34 inches coal on 3 inches or more of flint fire-clay and under 10 feet of massive sandstone.

On the right of the left branch opposite the mouth of Walnut fork, $\frac{1}{4}$ mile up the branch, Nathaniel Bentley has a twenty-yard entry, at altitude 1,315, with 35 inches of coal on what appears to be black slate, shale with calcareous concretions lying close below. "Draw slate," 4 inches thick covers the coal, on which is 8 feet of shale (making a good roof) and 5 feet of sandstone. The coal looks like Fire-clay coal, and it is not unlikely that the floor may prove to be black-jack.

On the left of a right hollow, $1\frac{3}{4}$ miles up the creek, Hugh Anderson has a ten-yard wet entry with 39 inches of coal (the bottom 8 inches not seen) under 10 feet of massive sandstone. Its altitude is 1,315, and this with its roof indicates the Fire-clay coal bed.

On the right $2\frac{1}{4}$ miles up and 50 feet above the creek, John Sparkman has a fifteen-yard entry at altitude 1,355 into 34 inches of coal under 5 feet of sandstone. The floor appears to be of flint fire-clay but was not positively proven.

The numerous openings on Branham creek would probably suffice for correlation were they fully developed, but under present conditions this cannot be done satisfactorily. The most important conclusion reached is that the Fire-clay coal rider may be the best bed on the creek, but that it has not been opened above Bentley fork. Nothing was seen of the Whitesburg bed.

MALLET FORK.

On the left, $21\frac{3}{8}$ miles up Carr. Altitude of mouth, 1,095.

At the creek, $\frac{1}{4}$ mile up it, is 6 inches of coal, with 6 inches parting, at altitude 1,125, under 20 feet of shale. This shale, in greater part, continues to the Amburgy coal bed about 30 feet higher.

The Amburgy coal has, on the left, $\frac{1}{2}$ mile up the creek, the following section:

Amburgy Coal.

Massive sandstone	10 ft.
Coal	 3"
Black slate	 1"
Coal	13"
Black slate	 1"
Coal	 4"
Altitude, 1180.	

SHOP HOLLOW.—On the right, $\frac{3}{4}$ mile up Mallet fork.

On the left, $\frac{1}{8}$ mile up the hollow, is 24 inches of coal with 2 inches black slate parting 4 inches from the top and with sandstone roof. Its altitude is 1,190 and it seems to be a remnant of the Amburgy bed.

On the right of a right drain, $\frac{1}{8}$ mile up hollow and drain, each, Samuel Williams has a three-yard wet entry with the following section:

Whitesburg Coal.

Shale (changing to thin sandstone at bottom)	 5 ft.
Black slate	 $1\frac{1}{2}$ ft.
Coal	 4"
Shale	 2"
Coal	 1"
Shale	18"
Black slate	 3"
Coal	 2"
Shale	 3"
Coal	23"
Shale	 2"
Coal	14"
Altitude, 1395.	

The Amburgy coal is apparently thin in a rock house at the mouth of a right branch, 1 mile up Mallet fork, at altitude 1,195.

On the left, $\frac{1}{8}$ mile up a left branch, $1\frac{1}{4}$ miles up the fork, Mrs. S. Sloan has a new entry beginning, beside a closed one, from which the following section was obtained:

Fire-clay Coal.

Sandstone	1 ft.
Coal	45"
Black-jack	3"
Flint clay	3"
Coal	10"
Shale	1"
Coal	6"
Altitude, 1380.	

At the forks, $1\frac{3}{8}$ miles up the creek and in it, is 10 inches of coal and shale, covered by a foot of shale with calcareous concretions, at altitude 1,225.

On the left, $\frac{1}{8}$ mile up the left fork, $1\frac{3}{8}$ miles from Carr, E. J. Short has a wet entry into a coal bed, probably the Fire-clay coal, though the roof is quite different to that usually found, as shown by the following:

Fire-clay Coal (?).

Sandstone	5 ft.
Shale	2 ft.
Coal	1"
Shale	3"
Black slate	2"
Shale	8 ft.
Coal bed	4 ft.
Altitude, 1385.	

HAYES BRANCH.

On the left, $21\frac{3}{4}$ miles up Carr fork.

Again on this branch, at its mouth, appears the 6 inches coal with 6 inches parting at altitude 1,125, as on Mallet fork.

On the left, $\frac{1}{8}$ mile up the branch, is the following:

Amburgy Coal.

Sandstone 5 ft.

Coal 4"

Cannel slate 1"

Coal 17"

Black slate 3"

Coal 3"

Altitude, 1145.

On the right, $\frac{1}{4}$ mile up, the Whitesburg bed, at altitude 1,285, is reported $11\frac{1}{2}$ feet thick. At the head of the right fork of the branch, on the right, $\frac{1}{4}$ mile from Carr, Lib. Hayes has a three-yard entry into the Fire-clay coal, at altitude 1,310, having 36 inches of coal on 10 inches of black flint fire-clay and bony coal, in about equal parts, and under 4 feet of soft clay shale, as it appears at the mouth of the entry.

On the left of a right branch of Carr fork opposite Hayes branch, Nelson Hayes has opened the Amburgy coal with section about the same as it was found on Hayes branch and at the same height, 1,145.

On the left of a left branch, at its head $\frac{1}{4}$ mile up, $21\frac{7}{8}$ miles up Carr fork, Robert Bates has a twenty-yard entry into the Fire-clay coal with southerly dip, at altitude 1,340 (or higher). It has 37 to 39 inches of coal on a black flint fire-clay floor, and under 6 feet of shale.

On the left of Carr fork and the road, 22 miles up Carr, the Amburgy bed is opened in a rock house with 20 inches of coal and a black slate parting 9 inches thick, 2 inches from the bottom. More coal may be under this. Its altitude is 1,190.

WILLARD BRANCH.

On the right, $22\frac{1}{8}$ miles up Carr. Altitude of mouth, 1,125.

On the left of a left branch, $\frac{1}{2}$ mile up Willard, $\frac{1}{4}$ mile up the branch, F. H. Thomas has an entry in to the Fire-clay coal at altitude 1,400, having 39 inches of coal,

flint fire-clay floor, and roof of 2 feet of shaly sandstone under 4 feet of massive sandstone.

On the left, $\frac{3}{4}$ mile up, the Amburgy bed is exposed, under a 10-foot massive sandstone cliff, with 27 inches of coal and 2 inches black slate parting, 7 inches from the top, its altitude 1,190, 10 feet above the creek.

On the left, a mile up, John B. Smith has a fifteen-yard entry; and on the left of the middle head, $1\frac{1}{4}$ miles up, Marian McIntyre has an entry. Their sections are as follow:

Smith.		Fire-clay Coal.		McIntyre.	
Shale	5 ft.	Shale	5 ft.	Shale	5 ft.
Coal	34"	Coal	31"	Coal	31"
Flint clay	4"	Flint clay	7"	Flint clay	7"
Coal	4"	Coal	5"	Coal	5"
Altitude, 1390.		Altitude, 1400.			

In the McIntyre entry the full thickness of the bottom coal may not have been obtained. The flint clay there is black.

On a left branch, $2\frac{1}{2}$ miles up Carr fork, the Amburgy coal shows at altitude 1,220, but its section is not exposed.

On the right of the branch, $\frac{1}{4}$ mile up it, Grant Honeycutt has an eight-yard wet entry into the Fire-clay coal at altitude 1,405. The main seam of coal is 36 inches thick and has regular cleavage. Under it is about 4 inches of black-jack and probably more coal below that. Five feet of shale is exposed over the opening.

On the right, $2\frac{3}{4}$ miles up Carr, at the head of a hollow, N. G. Sturgill has a wet entry with the following section:

Fire-clay Coal.	
Shaly sandstone	5 ft.
Coal	35"
Parting	5"
Coal	5"
Altitude, 1440.	

The parting is a mixture of black-jack and flint fire-clay.

NEALY BRANCH.

On the left 23 miles up Carr. Altitude of mouth, 1,125.

On the left of a left hollow, $\frac{3}{8}$ mile up this branch, William Franklin has an eight-yard wet entry giving the following:

Fire-clay Coal.

Sandstone	10 ft.
Coal	35"
Flint clay	4"
Bone coal	2"
Shale	6"
Coal	6"
Altitude, 1420.	

The bottom coal was not seen and it, with the coal above it, were measured approximately.

In the branch on the left, $\frac{3}{4}$ mile up Nealy, 5 inches of coal, under 15 feet of shale, lies at altitude 1,190, and on the right, $\frac{1}{8}$ mile up, is the following:

Amburgy Coal.

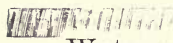
Sardstone	10 ft.
Coal	10"
Clay	1"
Coal	4"
Shale	3"
Coal	3"
Altitude, 1215.	

On the left fork of this left branch, $\frac{3}{4}$ mile from Nealy, are two abandoned entries, with a third just started, into the Fire-clay coal at altitude 1,405. The bottom coal and flint fire-clay are there, but were not open to measurement. The main coal seam is 37 inches thick and has normal cleavage planes. It has 5 feet of shale covering.

At the same distance from Nealy up the right fork of this branch, is a fifteen-yard entry on the right giving the following section:

Fire-clay Coal.

Shaly sandstone	4 ft.
Sandy shale	1½ ft.
Coal	2"
Clay	1"
Coal	36"
Black slate	1"
Fire-clay.	
Altitude, 1385.	

 Water prevented full examination of the fire-clay floor, but it seemed to be too hard for other than flint clay. That and the character of the roof, which is excellent, both indicate Fire-clay coal. Openings on this branch are on land of Simon Watts.

On the right of Nealy, at the mouth of this branch, James Mullins has a ten-yard wet entry into the Fire-clay coal, at altitude 1,410, having about 36 inches of the main coal seam, 4 inches of flint fire-clay and 3 inches of bottom coal, no measurements exact. The roof is 10 feet or more of massive sandstone, under which is 4 inches of coal and slate and 12 inches of weak clay sandstone to the main coal. These 16 inches come down with the coal leaving a good roof above.

On the right, 1¼ miles up Nealy, Elam Pigman has a ten-yard entry into the Fire-clay coal at altitude 1,425. The main coal seam is increased from 33 inches two yards in to 36 inches ten yards in. The floor is black jack or black slate. A good roof is given by 21 inches of sandy shale, above which is 2 inches of coal to massive sandstone above the coal.

On the right, 2 miles up Nealy, Mr. Pigman has another entry into the same bed at altitude 1,445, giving 38 inches of coal on an inch of soft black slate. Hard black slate and flint fire-clay, 6 inches or more, provide the floor, with possible coal below. A half-foot of clay on the coal and a foot of sandstone on that, the latter inter-leaved with thin sheets of coal, make a bad roof until they fall. Above them is exposed 7 feet of sandstone, making a good roof.

SPRING BRANCH.

On the right, $2\frac{3}{4}$ miles up Carr. Altitude of mouth, 1,130.

On the left, $\frac{1}{2}$ mile up the branch, 10 feet above it is the following:

Amburgy Coal.

Sandstone	3 ft.
Coal	3"
Slate	3"
Coal	15"
Coal and shale	9"
Altitude, 1255.	

On the left, $\frac{3}{4}$ mile up, George Gibson has a twenty-yard entry, and on the left a mile up, Arch Gibson has a twelve-yard wet entry. Their sections follow:

Fire-clay Coal.

George Gibson.

Sandstone	3 ft.
Coal	35"
Black-jack	2"
Flint clay	5"
Coal	7"
Altitude, 1450.	

Arch Gibson.

Shale	2 ft.
Shaly sandstone	2 ft.
Coal	37"
Hard bottom.	
Altitude, 1485.	

The bottom coal where seen was perfectly good. In the Arch Gibson entry the roof scales off in thin plates, but nevertheless space 25 by 30 feet is left without props.

On the right, $1\frac{1}{2}$ miles up, Edward Gibson has a twelve-yard entry into the Flag coal at altitude 1,880. The bed is 6 to 8 feet thick with about 5 feet of coal without parting visible, the remainder covered by falls from the roof, which is an extremely bad one, 10 feet of clay shale showing above the coal. The area of the bed here is small, though a half-mile of outcrop is in sight, with covering nowhere so much as 100 feet deep.

The cliff, 35 feet high, directly under the Hazard bed, shows below the opening; the altitude of its top, 1,800.

COLLINS BRANCH.

On the right $23\frac{3}{8}$ miles up Carr. Altitude of mouth, 1,130.

On the left, $\frac{3}{4}$ miles up the branch, Russell Collins has a three-yard entry, at altitude 1,355, into a bed with section following, which is a local development of a bed probably not continuous.

Whitesburg Coal (?).

Shale	5 ft.
Coal	25"
Shale	7"
Cannel coal	10"
Block coal	4"
Altitude, 1355.	

The cannel coal is of excellent quality, apparently, but it is reported to be explosive in burning. A flag stone quarry lies 40 feet below it.

On the right, $\frac{7}{8}$ mile up the branch, Green Craft has an abandoned prospect into the same bed (reported thick, but with bad roof) at altitude, 1,360.

Over this cannel opening is a five-yard entry with the following section:

Fire-clay Coal Rider.

Shale	8 ft.
Black slate	6"
Coal	8"
Shale	28"
Coal and black slate	8"
Coal	27"
Shale	1"
Coal	18"
Altitude, 1500.	

On the left of the right hollow, $11\frac{1}{8}$ miles up, $\frac{1}{8}$ mile up the hollow, the Fire-clay coal is opened at altitude 1,515. The main coal seam is probably of the usual thickness, about 3 feet, 2 feet being visible. Black-jack and flint fire-clay in the dump prove its correlation. It

has over it $2\frac{1}{2}$ feet of shale and then 2 feet of sandstone.

On the left, two miles up the branch, the Amburgy coal shows about 2 feet of coal under sandstone, at altitude 1,310.

On the left, $2\frac{1}{2}$ miles up, Hazel Collins has a twelve-yard entry with the section following:

Fire-clay Coal.

Shaly sandstone	5 ft.
Coal	34"
Flint clay	7"
Coal	13"
Altitude, 1540.	

The bottom coal, as well as the top, is good, and assurance of continued thickness is given by an opening across the ridge on Buck branch of Rockhouse having 4 inches more coal and 3 inches less parting. The parting here is all black.

On the left of Carr fork, $23\frac{3}{4}$ miles up it, $\frac{1}{4}$ mile from it, at the head of a hollow, Robert Bates has a five-yard entry as follows:

Fire-clay Coal.

Sandstone	3 ft.
Coal	37"
Black slate	2"
Flint clay	4"
Coal	5"
Altitude, 1440.	

An inch of bony coal in the middle of the bottom seam impairs its value probably very little. The sticking of an inch of the top coal to the slate under it is likely to be more troublesome.

BUFFALO BRANCH.

On the left, 24 miles up Carr. Altitude of mouth, 1,160.

On the right, a half-mile up this branch, Wiley Amburgy has a twelve-yard entry, from which the following was obtained:

Fire-clay Coal.

Sandstone.

Shale 6 ft.

Sandstone 1 ft.

Shale 1½ ft.

Coal 37"

Altitude, 1490.

A knife-edge parting, 6 inches from the top of the coal is so unusual as to be almost negligible here.

On the left, 24¼ miles up Carr, Alfred Amburgy has an entry, 270 feet above the creek, having the following section 10 yards in:

Fire-clay Coal.

Sandstone.

Coal 33"

Flint clay 6"

Coal 7"

Altitude, 1445.

ROARING BRANCH.

On the right, 24¾ miles up Carr. Altitude of mouth, 1,210.

On the left, ⅛ mile up this branch, John S. Amburgy has a five-yard entry, and on the right of a right hollow, ⅝ mile up, Doctor Sexton has a ten-yard wet entry. Both are in the Fire-clay coal and their bed sections follow:

Fire-clay Coal.

Amburgy.

Sandstone 5 ft.

Coal 35"

Flint clay 6"

Coal 6"

Altitude, 1475.

Sexton.

Shale 3 ft.

Massive sandstone 3 ft.

Coal 32"

Black-jack 2"

Flint clay 4"

Coal.

Altitude, 1510.

The bottom coal of the first entry is particularly fine-looking, half of it a rich splint coal. In the

second entry the bottom coal was not seen. There appeared to be about a foot of it.

On the right, $24\frac{7}{8}$ miles up Carr, William Amburgy has a two-yard entry into the top seam of the Fire-clay coal, 36 inches thick, at altitude 1,470. The flint fire-clay floor, doubtless, has coal under it. Two feet of shaly sandstone make the roof.

TURKEY BRANCH.

On the left, $25\frac{1}{8}$ miles up Carr. Altitude of mouth, 1,275.

In a peak on the right, $\frac{1}{4}$ mile up a left drain, $\frac{1}{8}$ mile up this branch, William Amburgy has a fifteen-yard wet entry into the Flag coal at altitude 1,925. The bed is 6 to 8 feet thick, of which about 2 feet was invisible, mostly block coal, but with a little splint. Fifteen feet of soft argillaceous sandstone covers the bed, and a hard sandstone caps the peak, which carries the only area of this coal in this vicinity.

WILDCAT BRANCH.

On the left, $25\frac{3}{8}$ miles up Carr. Altitude of mouth, 1,295.

A rock-house on the right, at the mouth of this branch, gives the Amburgy coal, just before it goes below drainage on Carr fork.

On the left, $\frac{1}{8}$ mile up the branch, the Fire-clay coal rider (probably) is opened in an eight-yard entry. Sections of these two beds follow:

Amburgy Coal.	Fire-clay Coal Rider. (?)
Sandstone 10 ft.	Sandstone 6 ft.
Coal 2"	Coal 17"
Shale 1"	Knife edge parting.
Coal 12"	Coal 7"
Shale 7"	Clay 1"
Coal 1"	Coal 4"
Shale 1"	Clay 2"
Coal 1"	Coal 10"
Sandstone.	Altitude, 1500.
Altitude, 1300.	

The bottom of the higher bed was not seen and there may be a little more than 10 inches of coal in that seam.

In a cliff on the left of Carr, rising from it at $25\frac{1}{2}$ miles up, is 30 feet of shale upon which is as much more sandstone, all overlying the rock-house sandstone covering the Amburgy coal.

On the left branch of Carr, $26\frac{1}{4}$ miles up it, which gives a road to Beaver creek, on the left of the road and right of the branch, $\frac{1}{4}$ mile up it, Wilburn Honeycutt has a twelve-yard wet entry into the Fire-clay coal at altitude 1,505. The main seam of the bed appears to be 3 to $3\frac{1}{2}$ feet of coal without parting. The flint fire-clay is below and 2 feet of shale under 4 feet of sandstone is exposed on top of the coal.

On the right, $26\frac{3}{4}$ miles up Carr, Wiley Amburgy has a twenty-yard entry with the following section:

Fire-clay Coal.

Sandstone	5 ft.
Coal	36"
Flint clay	6"
Coal	14"
Altitude, 1515.	

In a right branch, $26\frac{5}{8}$ miles up Carr, $\frac{1}{8}$ mile up the branch, is 10 inches of coal on sandstone and under sandstone 15 feet or more thick; its altitude, 1,435. Beside the branch, $\frac{1}{4}$ mile up it, the Whitesburg bed is exposed, with the section following. On the left, $\frac{3}{8}$ mile up the branch, 20 feet above it, is Grant Honeycutt's eight-yard entry into the Fire-clay coal, with the section following:

Whitesburg Coal.

Shale	
Coal	10"
Black slate	1"
Coal	2"
Fire-clay	6"
Covered	1 ft.
Sandstone	3 ft.
Black slate	2"
Coal	1"
Altitude, 1505.	

Fire-clay Coal.

Sandstone	3 ft.
Coal	33"
Black-jack	4"
Flint clay	3"
Coal	11"
Altitude, 1535.	

Two inches of the bottom of the Fire-clay coal bed has a slightly bony appearance, but is probably harmless.

On the left, 27 $\frac{1}{4}$ miles up Carr, Watson Adams has a prospect into the Fire-clay coal giving the section following. On the right and partly in the creek, 27 $\frac{1}{2}$ miles up Carr, at Omaha postoffice, Green Collins has an opening into the Fire-clay coal rider, its section also following:

Fire-clay Coal.

Sandstone	8 ft.
Sandy shale	6 ft.
Coal	3"
Shale	$\frac{1}{2}$ to 1"
Coal	30"
Flint clay	6"
Coal	10"
Altitude, 1615.	

Rider.

Shale	8 ft.
Black slate	8"
Coal	4"
Shale	1"
Coal	2"
Shale (with coal)	9"
Coal	2"
Shale	1"
Coal	16"
Coal (?)	36"
Altitude, 1660.	

The bottom seam of the Fire-clay coal has no bone in it. The bottom 3 feet of the rider being in water was not seen. The 2 feet that was felt appeared to be all coal.

**COALS ON THE NORTH SIDE OF NORTH FORK
FROM CARR FORK UP TO AND IN-
CLUDING BULL CREEK.**

COALS ON THE NORTH SIDE OF NORTH FORK FROM CARR FORK UP TO AND IN- CLUDING BULL CREEK.

On the right of the left fork of a left branch $\frac{1}{2}$ mile above Carr, at its head a mile from the river, Elijah Combs has an entry, at altitude 1,485, into good hard block coal, 37 inches thick, under 8 feet of shale. A foot or more of coal is reported under about a foot parting now serving as floor for the entry. With the ridge 200 to 300 feet higher a considerable area of this coal is available. It is of the Flag bed, the Fire-clay coal being at altitude about 1,100.

Desultory prospecting reported in this vicinity has failed to bring to light any other satisfactory coal, and no other opening was found below Felix branch, $3\frac{3}{4}$ miles above Carr fork, and $1\frac{3}{4}$ miles above Masu station at the mouth of Macie's creek.

On the right of the left fork of Felix branch, $\frac{1}{4}$ mile from its mouth, Felix Brashear has an eighteen-yard entry with the following average of a somewhat variable section:

Fire-clay Coal.

Sandstone	15 ft.
Shaly sandstone	5 ft.
Coal	32"
Black-jack	8"
Flint clay	3"
Coal	13"
Black slate	2"
Altitude, 1065.	

The bottom coal is a good hard block coal.

On the right of the right fork, $\frac{3}{8}$ mile up the branch, the top coal is 38 inches thick, the rest of the bed hidden. Its altitude is 1,050, about 165 feet above the river.

On the left, $\frac{1}{2}$ mile up a branch $2\frac{1}{4}$ miles above Masu, at the mouth of Macies creek, Nathaniel Brashear has a fifteen-yard entry with the following section:

Fire-clay Coal.

Shaly sandstone	5 ft.
Coal	39"
Flint clay	5"
Coal	5"
Black slate	5"
Shale	4"
Coal	8"
Altitude, 1100.	

Only the top seam of coal is taken out.

At $2\frac{3}{4}$ miles above Masu, 23 inches of coal was taken from an entry, now closed, at the level of the railroad track, altitude 930. This coal shows near the bottom of the following section taken from the mouth of a branch $3\frac{3}{4}$ miles above Masu and $\frac{1}{2}$ mile below Big branch.

Section.

Sandstone	40 ft.	
Covered, shale and sandstone	20 ft.	
Shale	25 ft.	
Coal	12"	} Amburgy Coal. Altitude, 965.
Shale	8"	
Coal	1"	
Shale	3"	
Coal	3"	
Fire-clay	1 ft.	
Sandstone	18 ft.	
Coal	23"	
Fire-clay	3 ft.	
Sandstone to track level	2 ft.	

The Fire-clay coal is exposed, slipped so that its measure could not be taken, in a rock-house $\frac{1}{2}$ mile up the branch, at altitude 1,155.

BIG BRANCH.

Hombre station, 6 miles above Carr fork. Altitude of mouth of branch, 905.

On the right of a left branch, $\frac{3}{4}$ mile up Big branch

and $\frac{1}{2}$ mile up the left branch, Sampson Brashear has an eight-yard entry with the following section:

Fire-clay Coal.

Sandstone	15 ft.
Coal	29"
Flint clay	4"
Coal	15"
Altitude, 1140.	

The bottom coal here is all good.

On the right of the left fork, at the forks of the creek, $2\frac{1}{2}$ miles from the river, the following is exposed, giving a section from the creek probably about up to the Whitesburg bed:

Section.

Sandstone	10 ft.
Shale	10 ft.
Sandstone	2 ft.
Coal	5"
Shale and coal	9"
Coal	6"
Fire-clay	1 ft.
Shale to water level	4 ft.
Altitude, 1145.	

On the right and left, $3\frac{1}{2}$ mile up, Thomas Fields has a four-yard entry and exposure in a rock-house of the Fire-clay coal, at altitudes 1,230 and 1,235, giving 24 and 31 inches, respectively, of coal in the main seam. Apparently there is no coal under the flint fire-clay. To that clay taken from the entry, a little of the coal adheres and so is lost.

On the right, $3\frac{3}{4}$ miles up, three entries at altitude 1,240 give 32 and 36 inches of coal over black-jack and flint fire-clay and common fire-clay next the flint. The coal thickens up stream, but no more openings have been made further up to see if the increase continues. The last entries are about 20 feet above the creek.

On the left of the river, $\frac{1}{8}$ mile above Hombre,

Richmond McIntyre has a wet entry at altitude 1,120, in which the top coal is 24 inches thick, and the bottom coal perhaps as much. Five feet of shale lies on the bed.

On the left of the river, $\frac{3}{4}$ mile above Hombre, opposite James Riddle's house, a prospect gave the following section:

Fire-clay Coal.

Shale	1 ft.
Coal	25"
Flint clay	4"
Coal	6"
Bone coal	3"
Black slate	4"
Bone coal	3"
Coal	6"
Altitude, 1090.	

Possibly the bone coal should be included with the good coal, depending largely upon whether it adheres to the slate or not. Farther entrance into the bed is necessary to determine this, or if it changes to good coal. With a considerable showing of pyrite flakes on top of the coal next under the fire-clay parting, the bed does not present a good appearance here, but, nevertheless, it is reported that mining is about to be begun upon it. Being alongside the railroad and only about 175 feet above it the location is particularly favorable.

FORD BRANCH.

One mile above Hombre. Altitude of mouth, 915.

On the left of the mouth of this branch Ellett McIntyre has a wet entry into the Fire-clay coal and on the left at the forks, $\frac{1}{2}$ mile up the branch, is a seven-yard entry into the same bed in the point of a hill and hardly under solid roof. These give the following section, respectively:

Fire-clay Coal.

Shale	2 ft.	Earth.	
Black slate	2 ft.	Coal	23"
Coal	21"	Flint clay	4"
Flint clay	4"	Coal	18"
Coal	21"	Altitude, 1155.	
Fire-clay	1 ft.		
Altitude, 1135.			

On the right fork of the left fork, from $1\frac{1}{2}$ to 2 miles up from the river, on land of Solomon Caudill, the following section was obtained, the Hindman bed showing on the left at the head of the branch, the bed next below being opened close by:

Section.

	Altitude.
Ridge tops, about	1700 to 1750
Hindman coal	1660
Francis coal—33 inches	1600
Flag coal—stain	1560
Cliff under Hazard coal	1480 to 1510
Young coal—reported 30 inches	1470

The comparatively broad tops to the hills of this vicinity give good working area to the Flag coal (which has not been opened), but higher coals are too restricted for other than local use.

On the right, $\frac{3}{4}$ mile from the river, at the head of a branch $1\frac{1}{2}$ miles above Hombre, at a closed entry on the Ira Banks farm the following was obtained:

Hindman Coal.

Broken sandstone.	
Shale	$1\frac{1}{2}$ ft.
Coal and shale	1 ft.
Coal	2 ft.
Thin parting.	
Coal.	
Altitude, 1730.	

The total thickness is reported to be 9 feet and evidently is nearly that, but the small area, bad roof and great height render the bed unattractive.

On the heads of a branch 2 miles above Hombre the cliff sandstone under the Hazard coal lies at altitude 1,540 to 1,570 and above this is the Flatwoods of the vicinity. Iron ore shows in small quantities at 1,590. At 1,625 the Flag coal is opened, showing a 3-foot bed with a 1-inch parting in its upper half, the lower half of the prospect being covered. The coal is somewhat slaty, the roof sandstone. The opening is about $\frac{1}{2}$ mile south of that of the Hindman bed just given.

A prospect in the point of a hill midway between the two openings last given shows a thin slaty coal at altitude 1,725. This is of the Hindman bed, but the place chosen for opening does not give a fair exposition of the coal, all but the hard and slaty coal having weathered away.

In the railroad cut at the point of the spur, $3\frac{1}{2}$ miles above Hombre the following is found:

Shale	15 ft.	
Coal	1 ft.	Altitude, 985.
Shale	15 ft.	
Coal	1 ft.	Altitude, 970.
Sandstone	15 ft.	

One or both of these coals, probably the upper, is of the Amburgy bed, close under which is often found a thin coal.

At Cornettsville postoffice, $3\frac{3}{4}$ miles above Hombre, S. W. Hampton has a seven-yard wet entry with the following section:

Fire-clay Coal.

Sandstone	4 ft.
Shale	7 ft.
Coal	18"
Flint clay	5"
Coal	24"
Black slate.	
Altitude, 1180.	

On a left branch at Elijah Sumner's, 4 miles above Hombre, the Amburgy bed has 18 inches of coal, lying on 20 feet of sandstone and under 12 feet of shale in

one place and under 3 feet of shale, then 20 feet of sandstone in another adjacent. Its altitude is 975.

On the left, $\frac{1}{8}$ mile up the branch, the Fire-clay coal has been opened at altitude 1,190, with possibly 3 feet of coal in the upper seam, and additional coal under a 5-inch flint fire-clay parting.

BULL CREEK.

Four and one-half miles above Hombre. Altitude of mouth, 930.

On the left at the mouth of the creek, 15 feet above it, the thin coal under the Amburgy bed shows about 8 inches thick with 15 feet of sandstone above and below it.

On the right a half-mile up the creek and 5 feet above it, the Amburgy bed is exposed, at altitude 985, with 2 feet of fire-clay and then 3 feet of thin-bedded sandstone beneath and 4 feet of sandstone above it.

On the left of a left branch a mile up the creek, 140 feet above it, $\frac{1}{8}$ mile up the branch, John Caudill has a three-yard wet entry, the only opening found on the creek into the Fire-clay coal. It gives in section:

Fire-clay Coal.

Sandstone	3 ft.
Shale	6 ft.
Coal	26"
Flint clay	4"
Coal	10"
Altitude, 1165.	

The bottom coal in water was not measured exactly, and thin cannel coal was reported below it.

On the right, $1\frac{3}{4}$ miles up the creek the following is exposed:

Shale	40 to 50 ft.
Coal	5"
Shale	$\frac{1}{2}$ to $1\frac{1}{2}$ ft.
Coal	7"
Shale	1 to 5 ft.
Sandstone in creek.	
Altitude, 1155.	

The upper 25 feet of this shale, with large lime boulders in it, begins to go under the creek on the right, $2\frac{1}{2}$ miles up it. On the shale is coal and black slate at altitude 1,220, probably of the Whitesburg bed, the usual sandstone under it having disappeared. This gives a rise of strata up the creek of about 80 feet in $1\frac{1}{2}$ miles.

Opposite the mouth of the large left branch, $3\frac{1}{2}$ miles up the creek, 30 feet of shales still remain above it with 10 feet of sandstone covering them.

At $4\frac{1}{2}$ miles up, 30 feet of shale above the creek appears again with 24 inches of coal at altitude 1,380 in it, 20 feet above the creek.

At $4\frac{3}{4}$ miles up this coal in shale is reduced to 8 inches, at altitude 1,410.

At the school house at the forks of the creek, $5\frac{1}{2}$ miles up it, the altitude, as determined by barometer, is 1,490.

At the head of the left fork, $\frac{3}{4}$ mile up from the school house and opposite the Green Combs entry on Montgomery creek, George Field has an eight-yard entry with section similar to that of the Combs entry, as follows:

Flag (?) Coal.

Massive sandstone	20 ft.
Coal	16"
Shale	5"
Coal	40"
Altitude,	1720.

This is all block coal, the lower seam hard. The hill tops are 150 to 200 feet higher and being well rounded in this "flatwoods" region, give a fairly good area to the bed.

On the right of the right fork and of the road to Defeated branch, a mile above the school house and a quarter-mile from the gap, James B. Caudill has a pit at altitude 1,695, from which has been taken coal said to be 30 inches thick. This is of the Hazard (?) bed, and it is not unlikely that a lower seam of the bed would be struck by sinking the pit a little deeper.

Above the pit is a two-yard entry into the Flag (?) bed, which here is somewhat farther from the Hazard

than is the case where the two have been opened in juxtaposition farther down the river. Its section follows:

Flag (?) Coal.

Sandstone	5 ft.
Coal	16"
Shale	6"
Coal	1 ft.
Shale	13"
Coal	40"
Altitude, 1760.	

**THE COALS OF MACIES AND LEATHERWOOD
CREEKS AND NORTH FORK BETWEEN
MACIES AND LEATHERWOOD
CREEKS.**

THE COALS OF MACIES AND LEATHERWOOD CREEKS AND NORTH FORK BETWEEN MACIES AND LEATHERWOOD CREEKS.

The area covered by this report includes the drainage basins of Macies and Leatherwood creeks and also that of the North Fork, Kentucky River, lying between those streams. It covers the southern part of Perry County, and embraces about 90 square miles.

The report embodies the results following recent visits to all coal openings of the region which were open at the time to examination and numerous others which had become more or less covered. To the information so acquired has been added that obtained on former visits, the whole giving as complete knowledge of the field as the present state of development permits.

Correlations have been established with a sufficient degree of certainty for most of the lower coals, but, with several similar beds of the higher coals in close juxtaposition and openings far apart, it is not unlikely that more thorough investigation may lead to a change from some of the correlations here advanced. It is believed, however, that such changes will not alter materially a general estimate of the field.

The accompanying maps of the two creeks, made from recent surveys by the Kentucky Geological Survey, give, in addition to altitudes along the streams obtained by spirit level, others of coal openings obtained by aneroid barometer, consequently approximate only, but seldom far amiss as they were derived from the true altitudes along the creeks as a base.

The topography of the region is similar to that of Eastern Kentucky generally, the steep hills enclosing narrow valleys and rising 500 to 1,000 feet to sharp ridges.

Strata in outcrop in the region are from about 50

feet below the Amburgy coal bed to some 300 feet above the Hindman coal bed, the total thickness nearly corresponding with the height of the highest hills.

The prevailing dip is northwestward, but on some of the branch streams flowing eastward, the larger ones especially, a reverse or a northeast dip is found. The average rate of dip from the mouth of Macies creek to the head of Leatherwood is about 50 feet per mile. The steepest pitch in the field is probably not over 100 feet per mile.

The succession of principal coal beds in outcrop and the approximate intervals between them are given following in descending order:

Hindman Coal Bed.

Interval, 150 to 200 feet.

Flag Coal Bed. (Locally No. 7.)

Interval, 40 to 50 feet.

Hazard Coal Bed. (Locally No. 6.)

Interval, 60 to 100 feet or more.

Haddix Coal Bed. (Locally No. 5.)*

Interval, 200 feet.

Fire-clay Coal Bed. (Locally No. 4.)

Interval, 60 to 70 feet.

Whitesburg Coal Bed.

Interval, 130 to 140 feet.

Amburgy Coal Bed.

The Elkhorn coal, mined at Jenkins and McRoberts, is about 200 feet below the Amburgy bed, and therefore below drainage and of unknown bed section.

The Amburgy coal bed, of especial importance on Carr fork, is barely of workable thickness on Leatherwood creek, where only in this region it appears above drainage. Lying about at river level at the mouth of that creek and rising with the drainage for over 2 miles up Little Leatherwood and for 8 miles up the main creek, such thickness as it has is easily accessible. The bed is thin, however, towards the mouth of the creek and, with no intermediate openings, shows workable thickness

*A coal, the "Young" coal of a former report, comes between the Haddix and Hazard beds and is occasionally more prominent than the Haddix. It is possible that in a few cases, where the interval between the Hazard and Haddix is apparently decreased, the coal called Haddix herein may be the Young coal with the Haddix unopened lower in the hill.

only just before going below drainage on the main creek.

The Whitesburg bed has been found at a few points only and at none of them in satisfactory condition; as the coal thickens partings increase. Its black slate roof, common elsewhere over a large area is, on Macies creek, a black shale and on Leatherwood a brown shale.

The sandstone between the Whitesburg and Fire-clay coals, which is especially noteworthy for its hardness over much of Kentucky river areas has lost that feature in this locality, and the bench of the latter coal is rarely prominent.

The Fire-clay coal is about 150 feet above the river at the mouth of Macies creek. On the Right fork are several openings with thick coal injured by partings, but the bed soon goes below drainage farther up the fork with diminishing thickness. On the Middle fork the thickness holds at about 3 feet above the flint clay parting, below which is a foot, more or less, of coal. The bed continues above drainage for 4 miles or more, but no openings into it appear to have been made beyond $2\frac{1}{2}$ miles up the Middle fork. Lack of openings on the Left fork is rather indicative of thinning in that direction, but the bed goes under the fork in about 2 miles.

Along the river from Macies creek to Leatherwood it appears that about 3 feet of coal in the upper seam can be counted upon, but the lower seam of the bed is either lacking or likely to be found much injured by partings.

On Leatherwood creek and its branches from the east the bed is above drainage nearly to their heads. The flint clay is usually the bottom of the bed, out of sight and not easily discovered without suitable tools, so that in many cases this means of identification was not available. Over the clay is generally $2\frac{1}{2}$ to 3 feet of coal, the excellent character of which seems usually to be maintained. While higher beds are thicker this one will probably supply the major part of the coal of this region.

The Fire-clay coal rider appears to be partly merged into the main bed on Macies creek, partly cut out altogether there and at other points on the river

and on Leatherwood creek, and, though thick enough to work on Little Leatherwood, the bed is of little importance. Sometimes associated with several other thin coals in the 60 feet above the Fire-clay coal, it is occasionally difficult to distinguish it from them. A well defined bench on the Leatherwood creeks, 30 to 40 feet above the Fire-clay coal, should help to do so on further development. Sometimes these coals seem to be obliterated by a heavy sandstone resting on the Fire-clay coal.

The Hamlin coal, 100 feet above the Fire-clay coal, not known to be of workable thickness elsewhere, is especially to be noted because of the fine appearance of its 32 inches of coal on Clover fork, Leatherwood creek.

The sandstone underlying the Haddix bed (containing pebbles on Clover fork of Leatherwood) becomes the most prominent in this region, showing cliffs such as those above that coal bed noted in previous reports, but apt to be higher and with rougher faces.

The Haddix coal is of very uncertain value here as elsewhere on account of variation of the bed and difficulty in getting to it through its envelope of loose rock broken from its sandstone covering at the outcrop.

On Line fork, opposite the heads of Leatherwood, the bed has six to eight feet of coal which formerly led to correlation with the thick Hazard bed, notably on Stony fork and Bark Camp branch of Leatherwood. That correlation being now abandoned, it remains to locate the Haddix bed anywhere on the upper half of Leatherwood creek, no knowledge of its presence there having yet been acquired.

Between the Haddix and Hazard beds is the place for the Young coal, but not known of workable thickness.

The sandstone overlying the Haddix bed is, perhaps, as prone to cliff-making as it has been found elsewhere, but the cliffs give little aid in correlation as they here resemble too closely those of the sandstone below.

The Hazard bed is probably of workable thickness throughout most of the right fork of Macies creek, but its height in the hill and restricted area with coal of only moderate thickness, do not make under the present slight development, an attractive exhibit. On the head

of the Middle fork the coal is thick enough but areas are small. Lack of development on the Left fork, with rather thin coal in the river hill below Leatherwood, is not promising for those localities.

On Leatherwood creek farther south than the mouth of Owen branch, the Hazard bed seems to be generally thick with sufficient areas for working on Beehive branch and Clover fork, and of increasing areas southward to Kentucky ridge, where the area is large notwithstanding a rapid rise of strata to it.

The Flag coal has workable thickness wherever found, but its openings are few, its height renders areas generally small and its correlation is somewhat uncertain.

The cliffs above the Flag coal which are particularly striking in capping ridges in northern Perry county have not that predominance in this region. The high sandstones are still in evidence, but they have lost the endurance which characterizes cliff-making rocks.

The Hindman coal bed, found in this region only on the heads of the Right fork of Macies creek, has good thickness but without much area. Kentucky ridge offers area enough to warrant search for the bed, which as yet appears not to have been made there.

Cannel coal is almost wholly lacking in this field, the only cannel seen being in a thin bed on Stony fork. Occasional reports of it elsewhere seemed to refer rather to cannel slate or to a very thin coal bed.

The following pages give details of openings visited and such other matter as seemed to merit notice. Each stream and its branches is taken in succession from its mouth to its head, the terms left and right being used as when looking up stream.

Surface distances given in miles are on the main streams, taken from the maps of the streams and are slightly longer than the corresponding distances by road. Distances on branch streams are more roughly approximate. Underground distances, in yards, are given without attempt at accuracy, but are not wide of the mark. Entries inaccessible because of water are denoted wet entries, those where the faces were not seen are called long entries. Thickness of strata given in feet are ap-

proximate only; given in inches they may be relied upon as correct.

MACIES CREEK.

RIGHT FORK.

On the right, $\frac{1}{4}$ mile up Macies creek. Altitude of mouth, 885.

On the right, $\frac{1}{2}$ mile up a right branch, $\frac{1}{4}$ mile up this fork, on the John Babcock land (later Burt and Brabb Lumber Co.), is an entry into the river hill which gave the following bed section:

Flag Bed.

Shale	3 ft.
Coal	16"
Clay	1"
Coal	41"
Altitude, 1450.	

Much of the upper two feet of the lower seam is splint coal; the lower 14 inches was measured under water and may contain a small parting. The correlation here is somewhat uncertain as it involves a rise of strata of about 100 feet from the mouth of the branch, against the prevailing dip but with the drainage. The bed here has enough covering over it to provide a fairly good working area.

On the left, a mile up the Right fork, Finley Hendricks has a twelve-yard entry into the Fire-clay coal, and below it, 5 feet above the creek, the Whitesburg bed is exposed. The sections there, and at John Hall's eight-yard entry into the Fire-clay coal follow, the latter entry being on the left $1\frac{3}{8}$ miles up the creek.

Fire-clay Coal.		Fire-clay Coal.	
Hendricks.		Hall.	
Sandstone	15 ft.	Sandstone	40 ft.
Coal	2"	Black shale	1 ft.
Shale	13"	Coal	3"
Coal	3"	Shale	2 ft.
Shale	1"	Coal	1"
Coal	1"	Shale	3"
Shale	2"	Coal	4"
Coal	3"	Shale	11"
Shale	2"	Coal	14"
Coal	38"	Shale	6"
Flint fire-clay	4"	Coal	24"
Coal		Flint fire-clay	5"
Altitude, 990.		Coal	13"
		Altitude, 1010.	

Whitesburg Bed.

Shale	1 ft.
Black shale	5 ft.
Coal	6"
Shale	7"
Coal	10"
Shale	5 ft.
Altitude, 940.	

In the Hendricks entry, measured at its face, the flint clay and coal under it are not taken up. In the Hall entry they are taken up two yards in and the bed section was obtained there. At both entries the upper parting contains iron-ore nodules.

On the right of the creek and road, $11\frac{1}{4}$ miles up, two abandoned entries into the Fire-clay coal show about 40 inches of coal under 2 feet of shale and coal with thick massive sandstone above.

An old opening, $13\frac{1}{4}$ miles up the Right fork, gave but 22 inches of coal in the Fire-clay coal bed, divided one foot down by a fire-clay parting of 4 inches. While it is not unlikely that this sudden reduction from the sections for this bed just given is partly due to an out-crop squeeze of the upper portion of the section, a workable bed cannot be fully relied upon farther up the creek.

BIG BRANCH.—On the right, $1\frac{7}{8}$ miles up the Right fork. Altitude of mouth, 1,005.

On the left, $\frac{1}{2}$ mile up this branch, on John Pratt's land, an incomplete opening has been made into the Flag bed, apparently, which gives the following section almost identical with that into the same bed on the hill behind the town of Hazard. Farther opening into the bed may give an improved section.

Flag Bed.

Shale.	
Coal	21"
Shale	3"
Coal	10"
Shale	1"
Coal	5"
Altitude, 1460.	

This bed lies on sandstone exposed in a cliff nearby, and 135 feet below it is the top of another cliff on which is the Haddix bed.

At $2\frac{1}{4}$ miles up the Right fork the Fire-clay coal is 30 feet above the creek, on the right, and there has 20 inches of coal under the fire-clay parting and 12 inches above it, and still more in what appears to be the roof, but from this point a roll carries the bed rapidly down into the creek, cutting out with sandstone much of the upper coal. Coal has been taken from the creek here, at altitude 1,020, but its thickness is not known.

On the left of a right branch, $2\frac{3}{4}$ miles up the Right fork, $\frac{1}{4}$ mile up the branch, a prospecting cut in the point of a small spur gave 2 feet of coal and shale under 5 feet of shale and with a sandstone cliff slightly higher. At altitude 1,315, about 300 feet above the Fire-clay coal, it is evidently of the Hazard bed. The opening was made where the coal may not show full thickness, and the cut was not carried in far enough to distinguish between coal and shale.

WOOTEN BRANCH.—On the right, 3 miles up the Right fork. Altitude of mouth, 1,050.

On the right, at the branch, $\frac{1}{2}$ mile up it, is the following exposure containing what appears to be the Fire-clay rider:

Shaly sandstone	8 ft.
Coal	14"
Clay	1½ ft.
Red shale	1 ft.
Coal	2"
Soft clay shale	4 ft.

At $\frac{3}{4}$ mile up the branch, and in it, is a foot of coal and shale under 8 feet of shale, the upper half sandy and the lower half clay shale. As the strata are rising for a short distance with the branch this, at altitude 1,110, may be of the same bed as that next preceding.

On the right, one mile up the branch, beside the road to Cutshin creek, a wet entry gives at its mouth the following section:

Hazard Bed.

Sandstone	5 ft.
Shale	1 ft.
Coal	27"
Black slate	6'
Coal	2"
Altitude, 1295.	

On the head of Wooten creek, on the Cutshin creek side of the ridge from this last opening, is another one, unfinished, giving 18 inches of coal, parted four inches from the top by one foot of clay containing coal. This, at altitude 1,305, is probably also of the Hazard bed.

On the right, $3\frac{1}{4}$ miles up the Right fork of Macies creek, a closed entry into the Hazard bed gives 39 inches of coal under 8 feet of soft shale at altitude 1,325. The top of a 25-foot cliff, above the entry is at altitude 1,365.

At J. P. Caudill's, $3\frac{1}{2}$ miles up, on the right $\frac{1}{4}$ mile up a left branch, the top of the same cliff is at altitude 1,380, and another coal, the Flag bed, shows 20 feet higher, making it here about 60 feet above the Hazard bed.

The following section is taken from my early report of coals found near Farler Postoffice at the forks, 4 miles up the Right fork; altitudes corrected to conform to recent leveling.

Section.		
	Interval to top of hill, 50 feet.	
	Sandstone	5 ft.
	Coal	7"
	Coal and shale	12" Altitude, 1545.
	Clay	
	Interval.	
	Sandstone	60 ft. Altitude, 1465.
	Interval.	
	Sandstone	20 ft. Altitude, 1425.
	Interval.	
	Shale	5 ft.
	Coal	4"
	Shale	9"
Flag Bed.	Coal	4"
	Shale	6"
	Coal	7" Altitude, 1395.
	Interval.	
	Shale	
Hazard Bed.	Coal	13" Altitude, 1360.
	Sandstone	5 ft.
	Interval.	
Young Bed.	Coal stain	Altitude, 1345.
	Interval.	
	Sandstone and shale.	
Hamlin Bed.	Coal and shale	20"
	Coal	15" Altitude, 1165.
	Interval.	
	Black slate	13"
60 ft. (?) above Fire-clay Coal.	Coal	15"
	Clay	2"
	Coal	12" Altitude, 1150.
	Interval.	
	Right fork at Farler.	Altitude, 110.

STAFFORD FORK.—On the left, 4 miles up Right fork.
Altitude of mouth, 1,110.

FIELDS FORK.—On the right, $\frac{5}{8}$ mile up Stafford fork.

On the left of a right branch, $1\frac{3}{4}$ miles up Fields fork, $\frac{1}{8}$ mile up the branch, Jason Fields has an entry into the Hindman bed, having a total thickness of about $6\frac{1}{2}$ feet, so far as could be made out, with coal and partings similar to those in Dehart's entry following on Wells fork. The lower foot of the bed was covered by water. Upon the coal is a foot of clay and then 10 feet of sandstone. It is too near the top of the hill to give workable area, so far as seen, being at altitude 1,750.

A prominent bench lies 50 feet lower and the top of a cliff, 390 feet lower, at altitude 1,360.

WELLS FORK.—On the right, 4 miles up Right fork. Altitude of mouth, 1,110.

On the left, $\frac{1}{8}$ mile up this fork are two wet entries, giving, under sandstone, a bed some 60 feet above the Fire-clay coal, with coal slightly less than obtained in the section just given.

By A. L. Dehart's house, at the head of Wells fork, $1\frac{3}{4}$ miles up and in it, is a pit from which coal of the Haddix bed, at altitude 1,350, has been taken. The sandstone under it gives a broad bench as soon as the creek has cut through it. Sandstone lies also close above the coal.

On the right from this coal is a twenty-yard entry, which, measured two yards in, gave the following bed section.

Hindman Bed.

Sandstone	40 ft.
Coal	16"
Shale	6"
Coal	11"
Shale	1"
Coal	9"
Shale	2"
Coal	35"
Clay	
Shaly sandstone	2 ft.
Altitude, 1680.	

On the right of Macies creek, $\frac{3}{8}$ mile from its mouth, $\frac{1}{8}$ mile above the Right fork, John H. Hall (former owner William Singleton) has an entry into the Fire-clay coal, in which measurements given below were taken.

On the left, $\frac{1}{2}$ mile up, Eli Hall has an opening into the same bed, which has been mined wide under a cliff and is now partly filled. Where posts were put to support the clay roof the clay has fallen away, leaving an open space between the top of the posts and the sandstone above them. A wedge of sandstone runs down through the clay to the coal, and also, in part, thin sandstone overlies the coal with the clay still above it. The bed section here is given following:

Fire-clay Coal.	
J. H. Hall.	Eli Hall.
Sandstone 10 ft.	Sandstone 10 ft.
Coal 28"	Clay 0 to 4"
Flint fire-clay 5"	Coal 33"
Coal 8"	Flint fire-clay 4"
Black slate 3"	Coal 7"
Bone coal 2"	Shale 5"
Altitude, 1020.	Coal 2"
	Shaly sandstone 20 ft.
	Altitude, 1025.

Henry Campbell (former owner Woolrey Campbell) has a new twelve-yard entry, on the right, $\frac{1}{2}$ mile up the creek, with bed section as follows, and an old one on the right, $\frac{3}{4}$ mile up the creek with bed section as taken formerly, also following. Coal from this entry is now used by the locomotive carrying timber and lumber along the creek.

Fire-clay Coal.	
New Entry.	Old Entry.
Sandstone 8 ft.	Coal 35"
Coal 34"	Flint fire-clay 5"
Flint fire-clay 4"	Coal 13"
Coal 7"+	Shale 2"
Bottom of bed not reached.	Coal 9"
Altitude, 1020.	Altitude, 1020.

MIDDLE FORK OF MACIES CREEK.

On the right, one mile up Macies creek. Altitude of mouth, 915.

On the right, $\frac{3}{8}$ mile up this fork, Benjamin Cornett has a ten-yard entry into the Fire-clay coal bed with 49 inches of coal and a parting of brown flint fire-clay 36 inches from the top, the upper seam of coal as measured at the face and the lower at the mouth of the entry. The altitude obtained, 1,030, is probably below the actual height.

POUND MILL BRANCH.—On the left, $\frac{1}{2}$ mile up Middle fork. Altitude of mouth, 963.

On the left, $\frac{1}{4}$ mile up the branch, Benjamin Cornett has a long wet entry giving 41 inches of coal 3 yards in, the lower 6 inches in water, and with 5 inches of flint fire-clay 32 inches from the top. Argillaceous sandstone covers it. Its altitude is 1,110, or possibly somewhat less.

On the left of Middle fork, $\frac{5}{8}$ mile up it, Mr. Cornett has a third wet entry, with 46 inches of coal and 4 inches brown flint fire-clay 35 inches from the top. It is covered by 3 feet of shale, 1 foot of black slate and one more of shale to the sandstone above. Its altitude as obtained is 1,110.

On a right branch, $\frac{3}{4}$ mile up Middle fork, on the right, $\frac{1}{4}$ mile up the branch, Mr. Cornett has a long entry, with 35 inches of top coal, 5 inches of brown flint fire-clay and 7 inches or more of coal under it; the bottom of the bed not reached. Its roof for 10 feet is sandstone and its altitude 1,045.

According to altitudes obtained of this bed from the mouth of the Right fork to this point, strata lie nearly level and then rise suddenly. It is more likely that the rise is actually nearly uniform and probably not quite so great as indicated.

On a right branch, one mile up Middle fork, $\frac{1}{8}$ mile up it, and $\frac{1}{8}$ mile up its right branch, on each side are wet entries of Lafayette Cornett's. The one on the right has the following bed-section measured at its mouth:

Rider to Fire-clay Coal.

Sandstone	15 ft.
Coal	2"
Shale	11"
Coal	3"
Shale	7"
Coal	4"
Shale	2"
Coal	37"
Altitude, 1110 (?).	

HOLLY THICKET BRANCH.—On the right, $1\frac{1}{2}$ miles up Middle fork. Altitude of mouth, 993.

On the right of the branch, $\frac{1}{8}$ mile up it, Rand Corbett has two abandoned entries with apparently $1\frac{1}{2}$ to 2 feet of coal, possibly more, under 2 feet of slate and shale. Three inches of coal separates the shale from the sandstone cliff above. This is of the Fire-clay coal bed at altitude 1,045.

On a left branch, $\frac{5}{8}$ mile up Holly Thicket, on the right at the mouth of the branch, Walter Hall has two entries, partly closed, with bed section at the mouth of one of them as given following.

On the left, $\frac{3}{4}$ mile up Holly Thicket, John Asher has an entry into the same bed with section approximately as follows:

Hazard (?) Coal.	
Hall.	Asher.
Shaly sandstone	Shale
Shale	4 ft.
10 ft.	Coal
Coal	4"
2"	Shale
Shale	8"
11"	Coal
Coal	16"
31" or more.	Altitude, 1390.
Altitude, 1395.	

At each place the shale, brown at the top, changes gradually to black at the bottom. The coal is probably of the Hazard bed.

On the left of Middle fork, $1\frac{7}{8}$ miles up, an unfinished prospect into the Fire-clay coal bed gives, under earth cover, 38 inches of coal and 6 inches flint fire-clay parting 27 inches from the top. It is quite possible that

complete opening would develop 6 to 12 inches more coal. Its altitude is 1,055.

LICK BRANCH.—On the right, $2\frac{1}{4}$ miles up Middle fork. Altitude of mouth, 1,055.

On the left, at the mouth of the branch, Robert Bra-shear has a ten-yard entry with section and analysis by the State Survey of my sample of coal above the fire-clay parting as given below:

Fire-clay Coal.

Shale and sandstone	15 ft.
Coal	28"
Bone coal	2"
Coal	10"
Flint fire-clay	6"
Coal (reported)	16"
Altitude, 1115.	

Analysis. (Upper Bench.)

Moisture	1.61
Volatile combustible matter	37.69
Fixed carbon	53.50
Light brown ash	7.20
	100.00
Sulphur	.67
Coke	60.70
B. T. U.	14,298

The bone coal appears to have increased the percentage of ash but little and is not likely to be continuous. The rest of the upper seam is a fine-looking, bright, soft coal, with irregular fracture.

On the left, $4\frac{1}{4}$ miles up Middle fork, Manuel Bra-shear has a long entry blocked by a fall of roof 15 yards in where the bed section following was obtained:

Hazard Bed.

Shale.	
Coal	9"
Shale	10"
Coal	24"+
Altitude, 1530.	

The lower coal seam was not fully exposed; it probably is about 30 inches thick. An exceptionally bad roof there is due in part to the light covering, it being only about 30 feet thick where the line of the entry crosses the ridge. The gap $\frac{1}{4}$ mile north, where the trail from the Middle to Left fork crosses the ridge, is at the same height as the entry, 1,530, and the area of the bed here is small. The character of the covering is somewhat indicative of the Hazard coal bed, but nothing determinative of correlation was seen in the vicinity. Assuming strata to lie at a nearly uniform slope from the upper opening of the Fire-clay coal to the Singleton entry on Leatherwood creek that bed would be about 330 feet beneath the Manuel Brashear entry, bearing out the assumption and the conclusion that the latter is of the Hazard bed.

OLD ROCK BRANCH.—On the right, $5\frac{1}{4}$ miles up Middle fork. Altitude of mouth, 1309.

In this branch at its mouth coal has been taken said to be 5 inches thick.

On the left near the head of the branch, $13\frac{1}{4}$ miles up it, and against a head of Trace branch of Cutshin creek, is a narrow prospect cutting said to have shown 9 feet of coal without parting. Some 4 to 5 feet of coal is still exposed, not enough to verify nor contradict the report. The area here is somewhat larger than at the Manuel Brashear entry, but still small. The bed, at altitude 1,500, appears to be again the Hazard.*

LEFT FORK OF MACIES CREEK.

On the right, one mile up Macies creek. Altitude of mouth, 915.

In a drain on the left of this fork, $\frac{1}{4}$ mile up it, the heirs of P. W. Hall have a wet entry into the Fire-clay coal giving at its mouth 36 inches of coal and a flint fire-clay parting of 5 inches, 31 inches from the top. Its altitude is 1,045. Nine inches of shale, under sandstone, covers the bed.

This bed probably goes below drainage near the

*Correlation is somewhat doubtful.

Road fork, 2 miles up from Middle fork, at altitude about 1,100.

On the left, $3\frac{1}{2}$ miles up, 10 feet above the stream, 8 inches of coal, under sandstone, shows at altitude 1,310. Also thin coal has been taken from the right branch there, $\frac{1}{8}$ mile up it, at about the same height.

The relation of this coal to the coal of the Manuel Brashear entry is so nearly the same as that of the thin coal taken from Old Rock branch of Middle fork, to the thick coal at the head of that branch, that it is regarded as helping to establish the correlation of the two beds. Thin coal may be found almost anywhere in the series of strata, but such similarity of occurrence is given some weight.

So far as was learned no other coal openings on this fork than those given are now open to view. A little prospecting was done in former years, but nothing remains of that work.

NORTH FORK FROM MACIES CREEK TO LEATHERWOOD CREEK.

On the right of the river, $2\frac{1}{4}$ miles above Macies creek, Hiram Baker has an eight-yard entry into the Fire-clay coal bed having 30 inches of coal at its face above the flint fire-clay which, at the mouth of the entry, is 5 inches thick. Two inches of coal are reported to be under the fire-clay. In the lower 3 feet of sandstone roof some coal appears. The 30 feet above that is sandstone with some shale. The bed lies 180 feet above the river, at altitude 1,070.

On the right of the river, $2\frac{1}{2}$ miles above Macies creek, James Brashear has a four-yard entry into the same bed, giving 27 inches of coal upon 4 inches of flint fire-clay and 4 inches of coal under the clay. The roof is sandstone and the altitude of the entry 1,090.

In a right drain, 3 miles above Macies creek, the same bed has been opened at altitude 1,090. Over it is 80 feet of sandstone, part shaly, under coal, slightly slipped. Either a great thickening of sandstone has occurred here or the Fire-clay coal rider has been completely cut out.

On a right branch, $3\frac{1}{2}$ miles above Macies creek, on

the left of the branch, $\frac{1}{8}$ mile up it, Joel Brashear has an opening giving 23 inches of coal, under sandstone, at altitude 940, about 160 feet below the Fire-clay coal, probably of the Amburgy bed, or of the upper part of it.

On the right, $5\frac{3}{8}$ miles above Macies creek, James Riddle has a now closed entry with the following section:

Fire-clay Coal.

Shale	2 ft.
Coal	24"
Flint fire-clay	3"
Coal	5"
Black slate	4"
Coal (?)	10"
Altitude, 1090.	

DIKE BRANCH.

On the right of the river, 6 miles above Macies creek. Altitude of mouth, 895.

On the left, $\frac{1}{8}$ mile up the branch, William Pratt has a wet entry with the following bed section:

Fire-clay Coal.

Shale	4 ft.
Coal	39"
Flint fire-clay	5"
Coal	4"
Black slate.	
(?)	
Altitude, 1155.	

The total thickness of the bed at the mouth of the entry is 62 inches, making the thickness of the black slate and coal below it (in water) 14 inches.

On a right branch, $6\frac{3}{4}$ miles above Macies creek, on the right, $\frac{1}{4}$ mile up the branch, the following section was obtained from a closed four-yard entry, showing a remarkable change in the strata overlying the coal from the thick sandstone at openings between this point and Macies creek:

Fire-clay Coal.

Massive sandstone	6 ft.
Brown shale	3 ft.
Coal	1 ft.
Soft dark shale	1½ ft.
Coal and soft shale	2 ft.
Dark brown flinty clay	1½ ft.
Thin-bedded sandstone (rusty)	1 ft.
Dark shale with lime and iron kidneys.....	1 ft.
Bright yellow clay	1 ft.
Dark shale with small iron kidneys	1½ ft.
Hard dark shale	6 to 8"
Brown shale	15"
Coal	34"
Flint fire-clay	5"
Coal	6"
Black slate (?)	17"
Coal	5"
Altitude, 1115.	

The lower parting has, in outcrop, much the appearance of block coal, but its weight condemns it.

The bright lemon-yellow clay over the coal is found also at one place on Leatherwood creek, but is not known to occur elsewhere.

CAMPBELL BRANCH.

On the right of the river, 7 miles above Macies creek, giving the short road to that stream and to Hazard. Altitude of mouth, 900.

On the right, ¼ mile up the branch, John B. Pratt has an entry, now closed, giving the following section:

Fire-clay Coal.

Sandstone	2 ft.
Shale	1 ft.
Sandstone	2 ft.
Shale	4 ft.
Coal	28"
Flint fire-clay	5"
Coal (?)	19"

It is probable that the bottom 19 inches includes some black slate which could not be distinguished from

coal at the time of measurement. This opening being not over $\frac{1}{2}$ mile from the one next preceding, the change in covering is especially to be noted.

BRIER BRANCH.

On the right of the river, $7\frac{1}{2}$ miles above Macies creek, 1 mile below Leatherwood creek. Altitude of mouth, 900.

On the right, $\frac{1}{4}$ mile up the branch, the Fire-clay coal is opened in a five-yard wet entry, at the mouth of which the following section was taken. The coal covering here, including the lemon-yellow clay, is very like that on the branch below Campbell branch, while the covering of the Campbell's branch coal differs, although about midway between them.

Fire-clay Coal.

Brown shale	3 ft.
Massive sandstone	2 ft.
Brown shale	2 ft.
Brown shale with iron kidneys	1 ft.
Dark shale	1 ft.
Bright yellow clay	$\frac{1}{2}$ ft.
Brown shale	$4\frac{1}{2}$ ft.
Coal	26"
Flint fire-clay	4"
Coal	7"
Black slate	6"
Coal reported about	12"
Altitude, 1100.	

On the left, $\frac{1}{2}$ mile up the branch and 10 feet above it, is the following, probably including one or all of the coals in the covering of the main bed on the branch below Campbell branch:

Rider to Fire-clay Coal.

Shale	5 ft.
Coal	6"
Shale	10"
Coal	10"
Shale	$1\frac{1}{2}$ ft.
Shaly sandstone	8 ft.
Altitude, 1140.	

Coal is exposed in the left fork of the branch, $\frac{1}{4}$ mile up it and 1 mile from the river, and from the coal and an adjacent prospecting cut on the left the following section was obtained:

Haddix Bed.

Shale	3 ft.
Coal	5"
Shale	9"
Coal	22"
Black slate	1 ft.
Sandstone	
Altitude, 1300.	

The interval from the Fire-clay coal to this one seems to prove the latter as of the Haddix bed, but it is not impossible that the latter may yet be found, slightly higher, directly under the next sandstone. The general pitch of strata is in favor of this view.

LEATHERWOOD CREEK.

The following section was obtained from the railroad cut opposite the mouth of this creek:

Section.

Shale	15 ft.
Coal	1 ft.
Shale	15 ft.
Coal	1 ft.
Sandstone	15 ft.
Railroad.	
Covered	30 ft.
River.	
Altitude, 905.	

The two coal seams probably represent the Amburgy bed, one of which, presumably the upper one, shows at several points along the road up the creek from its mouth to opposite the mouth of Little Leatherwood, under a sandstone cliff in place of the shale found at the railroad. It is reported, however, that there is a 4-foot bed of coal in the river, and, if this is true, then it must be of the Amburgy bed, and the other two seams are higher coals.

LITTLE LEATHERWOOD CREEK.

On the left, $\frac{1}{2}$ mile up Leatherwood. Altitude of mouth, 915.

On the left, $1\frac{1}{2}$ miles up the creek, 10 feet above it, this same upper seam, apparently, is still about one foot thick and under 20 feet of massive sandstone forming a low rock house at altitude 1,020.

At James Riddle's, $1\frac{3}{4}$ miles up the creek, a thin coal shows on a small bench on the right, at altitude 1,175, and above it, is an entry into a coal bed $2\frac{1}{2}$ feet (or more) thick, the bottom foot hidden in water. Over it is $1\frac{1}{2}$ feet of black shale with small concretions and then 2 feet more of the shale without concretions. This bed is the Fire-clay coal rider at altitude 1,270.

BENT BRANCH.—On the left, 2 miles up the creek. Altitude of mouth, 1,048.

In the branch, $\frac{1}{8}$ mile up it, a thin coal shows on sandstone at altitude 1,065.

On the right of the branch, $\frac{1}{4}$ mile up it, F. A. Griffee has a four-yard entry into a coal bed 3 feet thick, containing about 2 feet of coal with three partings, the lower one, of 6 inches, being rash coal. This appears to be of the Fire-clay coal bed at altitude 1,215. It is covered by about 6 inches of black slate and then two feet of shale exposed.

On the left of the creek, $2\frac{1}{4}$ miles up Little Leatherwood, Lindsey Holcomb has an entry, fallen in, said to have 28 inches of coal, under sandstone, and with flint fire-clay floor. It is but about $\frac{1}{4}$ mile from the Griffee entry and nearly certainly of the same Fire-clay coal bed—with altitude 1,225.

Coal 1 to $1\frac{1}{2}$ feet thick is reported 25 feet higher corresponding with the coal of the Riddle entry into the rider.

TWIN BRANCH.—On the right, $2\frac{1}{2}$ miles up the creek. Altitude of mouth, 1,060.

On the left, $\frac{1}{2}$ mile up the branch, the former Pratt entry still shows coal upon flint fire-clay at altitude 1,265.

FENDER CREEK.—On the left, 4 miles up Little Leatherwood. Altitude of mouth, 1,128.

A section taken for the Survey in 1884 gives the following coals found in the vicinity of the mouth of the creek with altitudes corrected to conform to recent levels:

Section.		
Haddix Coal.	Coal stain	Altitude, 1485.
	Interval.	
	Shale.	
Rider (?)	Coal 9"	Altitude, 1365.
	Interval.	
	Sandstone	
	Black slate 12"	
Fire-clay Coal.	Shale 1"	
	Coal 26"	Altitude, 1305.
	Interval.	
	Shale.	
	Coal 6"	
Whiteburg Coal.	Shale 3"	
	Coal 2"	
	Shale 5"	
	Coal 17"	Altitude, 1240.

The Haddix bed may prove workable, but, in this immediate vicinity, the hills appear not high enough to give much area. Back from the main creek, that and the Hazard bed may both be found of workable thickness and area.

On the right, 1 mile up Fender creek, Moses Isom has a ten-yard entry into the Fire-clay coal, 32 inches thick at the face. Its floor is argillaceous sandstone and over the coal 8 feet of shale. Its altitude is 1,355.

Opposite this last entry Mr. Isom has another, now closed, beside the road, giving the following section at its mouth:

Fire-clay Coal.	
Shale	5 ft.
Coal	48"
Sandstone	6 ft.
Thin coal	
Clay	
Altitude, 1355.	

This 48 inches includes possibly a 1-inch parting 1 inch from the bottom.

On a right branch, $4\frac{1}{8}$ miles up Little Leatherwood, on the right, $\frac{1}{4}$ mile up the branch, Marian Holcomb has a six-yard entry into the Whitesburg bed, measured at its face, and opposite, on the left, a three-yard closed entry into the Fire-clay coal bed. These are given below:

Whitesburg Bed.		Fire-clay Coal Bed.	
Shale	5 ft.	Shale	2 ft.
Coal	6"	Coal (reported)	26"
Shale	1"	Altitude, 1310.	
Coal	5"		
Shale	1"		
Coal	18"		
Altitude, 1260.			

On the next right branch, $4\frac{1}{4}$ miles up Little Leatherwood, on the left, $\frac{1}{2}$ mile up the branch, Harvey Holcomb has a one-yard entry into the Fire-clay coal, about 28 inches thick, the lowest 6 inches not seen, under 8 feet of shale. Its altitude is 1,330.

On the next right branch, $4\frac{3}{8}$ miles up Little Leatherwood, on the right, $\frac{1}{4}$ mile up the branch, William Hall has an open cut into the Fire-clay coal bed, giving, under soft clay covering and on a flint fire-clay floor, coal varying from 24 to 28 inches in thickness, at altitude 1,360.

Opposite, on the left of the branch, he has an entry into the same bed.

NAT BRANCH.—On the right, $4\frac{1}{2}$ miles up Little Leatherwood. Altitude of mouth, 1,145.

At the head of the branch, $\frac{3}{8}$ mile up it, and about the same distance south of the gap with trail to Beehive branch, Mrs. Shepard has a wet entry, giving, under 5 feet of shale, 43 inches of coal, including 8 inches in water and not seen, at altitude 1,740. This is 180 feet above the gap with trail and only about 100 feet below the summit of the hill, and it has, therefore, very little area on this branch.

Allowing for a slight rise of strata from the nearest Fire-clay coal openings on Little Leatherwood and on Owen branch brings this coal into the horizon of the Francis bed (a bed not known to be workable south of Carr fork), but it is more likely that a greater rise occurs, in which case this is the Flag bed, or, possibly, even the Hazard. The thickness of the coal is rather indicative of the latter.

Thin coal on the left of Little Leatherwood at the mouth of Seng branch, $5\frac{3}{4}$ miles up the creek, 15 feet above it, is about on the level of, probably a little above, the Amburgy bed.

Another thin coal, probably of the Whitesburg bed, has been taken from the creek, $6\frac{3}{4}$ miles up it, in front of the Joseph Holcomb house, at altitude 1,380. Ten-feet of shale overlie and 15 feet underlie the coal, as shown in the creek bank below the pit from which the coal was taken.

In the creek at its head, 7 miles up it, on the right of the trail to the head of Big Leatherwood, Mr. Holcomb has a five-yard entry into the Fire-clay coal, giving at its mouth 29 inches of coal under 20 feet of sandstone. The coal has the usual excellent appearance of this bed, except that 3 or 4 inches, 9 inches from the bottom, is somewhat slaty. The altitude obtained is 1,495.

Coal is reported at a spring on the ridge to the right of the entry at altitude 1,670, evidently of the Haddix bed. The interval from this down to the Fire-clay coal, 175 feet, is rather small, and from that to the bed below, 115 feet, too large for the Whitesburg bed. It is probable that the actual altitude of the Fire-clay coal at the entry is about 1,450 or 1,460, instead of 1,495 as obtained.

Coal has been opened, but apparently it is thin, above the spring, at altitude 1,720, the Hazard coal. The hilltop here is but little over 100 feet high, but a considerable area of this coal lies in the vicinity.

HICKS BRANCH.

On the right, $1\frac{1}{4}$ miles up Leatherwood creek. Altitude of mouth, 944.

On the left, $\frac{1}{8}$ mile up this branch, Manning Corbett has a closed entry into the Fire-clay coal, with covering similar to those on either side of Campbell branch. The full section obtained at the mouth of the entry is:

Fire-clay Coal.

Thin-bedded sandstone.	
Dark shale	5 ft.
Dark shale with concretions	$1\frac{1}{2}$ ft.
Black slate	10"
Brown clay	8"
Coal	20"
Flint fire-clay	4"
Shale	3"
Coal	5"
Shale	4"
Coal	13"
Altitude, 1185.	

The roof of this entry is extremely bad.

RIGHT FORK.—On the right, $\frac{1}{4}$ mile up Hicks branch. Altitude of mouth, 955.

On the right at the mouth of the branch, the Amburgy bed, under 5 feet of shale, gives 20 inches of coal at altitude 965.

On the left, $1\frac{1}{4}$ miles up the Right fork, and by it, the following section is exposed:

Fire-clay Coal.

Sandstone.	
Shale	10 ft.
Black shale with calcareous concretions.....	10 ft.
Coal	6"
Altitude, 1120.	

The concretions over the coal determine this as of the Fire-clay coal bed, but it is probable that more coal lies under the 6 inches in the stream.

On the right, $1\frac{1}{4}$ miles up the fork, an opening has

been made into the Fire-clay coal rider, under shale and apparently thin, at altitude 1,150.

LEFT FORK.—On the left, $\frac{1}{4}$ mile up Hicks branch. Altitude of mouth, 955.

In this fork a thin coal shows under black slate at altitude 1,005. Strata rising quite rapidly here, it appears to be too low for the Whitesburg bed.

On the right, $\frac{7}{8}$ mile up the fork, a prospect into the Fire-clay coal bed gives the following section, the correlation determined by the strata exposed over the coal, duplicating that over the Manning Cornett entry on Hicks branch.

Fire-clay Coal.

Thin-bedded sandstone.	
Dark shale	5 ft.
Dark shale with concretions	1 ft.
Black slate	6"
Brown clay	4"
Coal and shale	28"
Altitude, 1160.	

The coal bed consists of 28 inches of coal and 4 or 5 partings, the bottom 6 inches hidden in water.

On the left, 1 mile up the fork, and on the left of the road, a wet entry gives, at its mouth, the following:

Fire-clay Coal.

Sandstone	5 ft.
Shale	3½ ft.
Coal	½"
Shale	1½ ft.
Coal	36"
Flint fire-clay	
Altitude, 1205.	

The bottom 6 inches of the coal was covered and not seen.

On the left of the fork at its head, $1\frac{3}{4}$ miles up, the Riverside Coal Company has a wet entry giving the section following:

Haddix Coal.

Sandstone	6 ft.
Cannel slate	8 to 10"
Shale	5"
Coal	41"
Altitude, 1505.	

The bottom foot was in water and not seen. The bench of the Hazard coal lies about 50 feet higher.

On the right of Leatherwood creek, 2 miles up, between the road and Arch Cornett's house, the upper one of the two thin coals at the mouth of the creek shows under 15 feet of sandstone. It is 14 inches thick and its altitude is 1,020.

DEEP HOLE BRANCH.

On the left, $2\frac{1}{4}$ miles up Leatherwood. Altitude of mouth, 965.

On the left, $\frac{1}{4}$ mile up, coal 10 inches thick under 20 feet of sandstone, with 2 feet of black slate between them, lies at altitude 1,020.

Coal taken from the branch, $\frac{3}{4}$ mile up it, under 10 feet of shale, probably of the same bed as the two next preceding exposures, lies at altitude 1,065.

From the forks, $\frac{3}{4}$ mile up the branch, on the left, $\frac{1}{2}$ mile up the right fork is Arch Cornett's wet entry with the section following:

Fire-clay Coal.

Sandstone	8 ft.
Shale	$1\frac{1}{2}$ ft.
Coal	5"
Clay	5 ft.
Coal (about)	27"
Altitude, 1295.	

Water in the entry prevented accurate measurement. In this opening the covering similar to that of the Fire-clay coal opening one mile up the Left fork of Hicks branch, gives the correlation.

At the mouth of a right branch, $2\frac{3}{4}$ miles up Leatherwood, the same bed as that exposed along the creek below has 10 inches of coal at altitude 995, under sandstone.

PUNCHEON CAMP BRANCH.

On the right, $3\frac{3}{4}$ miles up Leatherwood. Altitude of mouth, 990.

On the right of the branch at its mouth, the same small bed appears again, under 6 feet of sandstone, with 16 inches of coal and 2 inches of shale one inch below the top, at altitude 1,010.

From the forks, $\frac{1}{2}$ mile up the branch, on the left, $\frac{1}{8}$ mile up the left fork, Mrs. Ison has an entry into a coal bed 3 feet thick, two-thirds covered with water and under 15 feet of shale. Its altitude, 1,250, seems to be too high for the Fire-clay coal, but right for its rider.

At Henry Singleton's $4\frac{1}{4}$ miles up Leatherwood, on the right, $\frac{1}{8}$ mile up a right branch, an old entry still in use, gives 80 yards in, the following section:

Fire-clay Coal.

Shale.	
Coal	7"
Bituminous shale	5"
Coal	31"
Flint fire-clay	5"
Altitude, 1245.	

There is no coal below the dark flint fire-clay floor. The parting near the top is soft and can be made available as a mining seam. The roof is fairly good.

BEE HIVE BRANCH.

On the left, $4\frac{1}{4}$ miles up Leatherwood. Altitude of mouth, 1,005.

An old opening into the Amburgy bed, probably, on the left, $\frac{1}{2}$ mile up the branch, at altitude 1,065, gave thin coal directly upon sandstone. On the left, $\frac{3}{4}$ mile up the branch, the same bed, at altitude 1,090 shows 30

feet of shale above it; the lower third of the exposure carries small lime concretions. On the right, $\frac{7}{8}$ miles up the branch, at its level and opposite the mouth of a left branch, the same coal is exposed 16 inches thick, at altitude 1,095.

One-eighth mile up that left branch, on the right, $\frac{1}{2}$ mile up its left branch, an eight-yard wet entry into the Fire-clay coal, has about 2 feet of coal under 3 feet of shaly sandstone and is at altitude 1,330.

On the right, 2 miles up Bee-hive branch, on the way to Beech Rock branch, the Kentucky Union Land Co. has a ten-yard entry into the Fire-clay coal giving at its face 27 inches of coal and a black slate parting 6 inches thick, almost an impure coal, one inch from the bottom. The bed here has sandstone floor and roof and is at altitude 1,390.

The same bed is opened on the left, $2\frac{1}{4}$ miles up the branch, with coal reported $2\frac{1}{2}$ to 3 feet thick.

It is also reported that the Fire-clay coal has been opened in several other places farther down the branch, but always with less than $2\frac{1}{2}$ feet of coal.

On the right, at the forks, $2\frac{3}{4}$ miles up the branch, the Hazard (or Haddix) coal has been opened, but is now covered, at altitude 1,655.

Directly above this is a fifteen-yard wet entry of Kentucky Union Land Company, which, not under good cover, gave the following bed section 3 yards in:

Flag (or Hazard) Bed.	
Shale	3 ft.
Coal	34"
Shale	3"
Coal	3"
Altitude, 1710.	

The Hazard (or Haddix) bed has another opening in the point of the hill between the forks at this same place, now nearly covered, but showing a bed too thin to work.

OWENS BRANCH.

On the right, 5 miles up Leatherwood. Altitude of mouth, 1,015.

On the right, $\frac{1}{4}$ mile up a left branch, $\frac{3}{4}$ mile up

Owens branch, Jack Callahan has a long entry into the Fire-clay coal. Beneath shale roof, it has 42 inches of coal and a 1-inch shale parting, 7 inches from the top, as measured 3 yards in. The bottom half of the bed, in water, was not seen. Its altitude is 1,255.

RIGHT FORK.—On the right, $\frac{7}{8}$ mile up Owens branch. Altitude of mouth, 1,140.

On the right at the mouth of a right branch, $\frac{1}{4}$ mile up this fork, T. G. Campbell has a ten-yard entry into the Fire-clay coal, which, under 5 feet of shale, is at the face 35 inches thick, including 1 inch of shale parting 7 inches from the top. The coal is all moderately soft, the bottom 3 inches said to be particularly good for blacksmithing. Its altitude is 1,275.

On the right at the head of the fork, $1\frac{1}{4}$ miles up it, beside the path to Macies creek, is a five yards wet entry into a coal bed about $4\frac{1}{2}$ feet thick with, apparently, a parting of 2 inches about 5 inches from the top. The lower 6 inches was not seen. Over the bed is $11\frac{1}{2}$ feet of shale and then massive sandstone. Its altitude is 1,620. This is 115 feet higher than the opening on the head of Hicks branch, and, assuming what is probably the case, that strata lie nearly level between the two, this is of the Flag bed.

LEFT FORK.—On the left, $\frac{7}{8}$ mile up Owens branch. Altitude of mouth, 1,140.

A thin coal under 10 feet of sandstone, $\frac{3}{4}$ mile up this fork and at its bed, at altitude 1,270, probably represents the rider to the Fire-clay coal.

On the left at the head of the fork, one mile up it, an opening has been made into a coal bed reported 9 feet thick including a thick parting. It lies at altitude 1,575, but is now so covered that neither coal nor roof is visible. It is not much more than a mile from the reported thick coal of Middle fork of Macies creek, on Old Rock branch, and is of the Hazard bed.

On the right of Leatherwood, $5\frac{7}{8}$ miles up the creek, John M. Gilliam has a twelve-yard entry into 33 inches of coal measured 4 yards in, at altitude 1,230. Two inches of coal in the middle of the bed are slightly slaty, but the rest is fine-looking, rather soft. The floor

is shale and 5 feet of massive sandstone lies on the coal. The bed is close to the level of the Fire-clay coal and may be it, notwithstanding its different section at the first opening up Beech fork.

BEECH FORK.

On the right of Leatherwood, 6 miles up the creek. Altitude of mouth, 1,040.

On the right, $\frac{3}{4}$ mile up this fork is an eight-yard entry, which, measured half way in, gives the following bed section:

Fire-clay Coal.

Shale	10 ft.
Coal	2 to 4"
Black shale	24"
Coal	8"
Shale	1"
Coal	5"
Shale	17"
Coal	12"
Flint fire-clay.	
Altitude, 1220.	

In a left branch, $1\frac{1}{4}$ miles up Beech fork, and $\frac{1}{4}$ mile up the branch, 20 to 24 inches of coal shows at altitude, 1,205. This is of the Fire-clay coal bed, having here sandstone close below it and above it, mostly, to a bench some 50 feet higher.

On the right of a left branch, as its mouth, $1\frac{3}{4}$ miles up Beech fork, the Fire-clay coal is again under 5 feet of shale, and has 39 inches or more of coal and a shale parting of 6 inches, 12 inches from the top. The bottom 6 inches was not seen. Its altitude is 1,230.

This same bed is opened on the left, $2\frac{1}{2}$ miles up Beech fork, in the Callahan entries, one long and closed, and one twelve-yard entry adjoining, from the face of which were taken the measurements following and my sample of the coal, analyzed for the Survey with the following results:

Fire-clay Coal.

Shale and sandstone.	
Coal	7"
Shale	1"
Coal	30"
Altitude, 1230.	

Analysis.

Moisture	1.80
Volatile combustible matter	38.66
Fixed carbon	53.84
Ash (brown)	5.70
	100.00
Sulphur	0.69
Coke	59.54
B. T. U.	14,447

The coal is somewhat soft, excepting an inch of bone, included in the sample, lying on the parting. It has an irregular fracture. A hard clay forms the floor of the entry and is probably a variation of the characteristic parting.

From an earlier investigation the following section was obtained in this vicinity:

Section.

	Altitude.
Hill top	1850
Coal stain..... Francis bed (?)	1690
Limestone iron ore	1630
Coal stain..... Hazard bed (?)	1530
Coal..... 11" in sandstone	1330
Coal..... 35" (6 partings 17½ in.).....	1300
Clay, coal and shale..18" } under shale.....	1255
Coal 8" }	
Callahan entry coal	1230

The four coals of the lower part of the section, because of their proximity and varying sections and coverings, somewhat obscure correlation. but there is little reason to doubt that the lowest one is of the Fire-clay coal bed. The one 70 feet higher (at 1,300) has been considered, in some instances where the interval

was 20 or 30 feet less, to be the rider to that bed, but, with the thin intermediate coal to answer for the rider, the higher coal may well be considered of the Hamlin bed.

No openings appear to have been made on the high coals of Beech fork, and one may only conjecture that the coal stains found in that section are of the Hazard and Hindman beds. From surrounding openings on other streams there may be expected here two other workable beds in the high hill examined.

Other exposures on this stream serve merely to give the dip of strata, which fall rather rapidly from Bee-hive branch westward to the mouth of Beech fork, then flatten out and reverse to a slight eastward dip a mile or two up the fork.

On the left, $2\frac{3}{4}$ miles up Beech fork, a thin coal, the Fire-clay coal rider, shows under 5 feet of shale at altitude 1,280, 25 feet above the creek, where the main bed probably lies.

LEFT FORK.—On the left, 3 miles up Beech fork. Altitude of mouth, 1,300.

On the left, $\frac{1}{4}$ mile up this fork, the same thin coal shows again under 10 feet of shale at altitude 1,320.

On the left, $\frac{1}{2}$ mile up the fork, the coal of many partings at altitude 1,300 of the preceding section is apparently only 8 inches thick, under 5 feet of shale and then sandstone, at altitude 1,360.

On the right, $6\frac{3}{4}$ miles up Leatherwood creek, the following section has been opened:

	Altitude.
Shale	5 ft.
Coal (with 1 in. parting).....17".....	1280
Sandstone.	
Shale.	
Coal (with 0 to 2 in. parting) ..17" (Fire-clay coal) ..	1265

The lower coal seam might be supposed a slip from the upper, but that the solid rock is exposed between the two. The upper one may be a part of the Fire-clay coal bed or its rider. Its parting is shale while that of the lower seam is sandstone.

On the left of Leatherwood, 7 miles up it, an old prospect gives the Fire-clay coal bed, $3\frac{1}{2}$ to 4 feet thick with no parting apparent, under 5 feet of shale, at altitude 1,280.

GRAVE BRANCH.

On the left, $7\frac{1}{4}$ miles up Leatherwood. Altitude of mouth, 1,080.

On the left, $\frac{1}{8}$ mile up the branch, is exposed in a cliff the section following:

Section.

Sandstone	10 ft.	
Coal	12"	Altitude, 1165.
Fire-clay.		
Sandstone	5 ft.	
Coal	6"	
Sandstone.		

On the right, $\frac{1}{4}$ mile up the branch, a prospect cut, hardly complete, gives the following:

Whitesburg Coal.

Shale	5 ft.
Coal	24"
Shale (1 in. coal).....	6"
Coal	21"
Altitude, 1235.	

Above this last opening a former visit gave the following—former John Couch opening:

Hazard Bed.

Shale.	
Coal	60"
Clay	12"
Shale	6"
Coal	12"
Altitude, 1565.	

The thickness and parting here are strongly indicative of the Hazard bed, and assuming the Fire-clay coal to be at altitude 1,300, conformity with the usual inter-

vals from it to the Whitesburg and Hazard beds is nearly obtained. From the Fire-clay coal opening next below the branch to this one a slight rise in continuation of that farther down the creek results, and the interval to the Amburgy bed opened on Clover fork is also in agreement. Here is the best opportunity for getting intervals between the coals which the present development on the creek affords.

CLOVER FORK.

On the right, $7\frac{1}{4}$ miles up Leatherwood creek. Altitude of mouth, 1,085.

On the left, $\frac{1}{8}$ mile up this fork, William G. Cornett has a five-yard wet entry with the following section:

Amburgy Coal.

Shaly sandstone	5 ft.
Coal (with parting) ..	9"
Shaly sandstone	10 ft.
Shale	5 ft.
Coal	3 to $3\frac{1}{2}$ ft.
Altitude, 1095.	

The main coal showed no parting and probably exceeds 3 feet very little.

On the left, 50 yards beyond the entry and 50 feet higher, altitude 1,145, is 11 inches of coal beneath 10 feet of shaly sandstone. This corresponds to one of the seams of coal found on the left of Grave branch, showing the Amburgy bed to be there at about altitude 1,115.

On the left, $\frac{1}{4}$ mile up the fork, the Fire-clay coal has been opened 28 inches thick, under 5 feet of shale, and then sandstone at altitude 1,285.

In the next left drain, 100 yards farther up the fork, 32 inches of coal, partly splint under 3 feet of sandstone, is opened at altitude 1,390. This appears to correspond to the coal found 70 feet above the Fire-clay coal on Beech fork and is of the Hamlin bed. It looks well here but is usually without value.

RIGHT FORK.—On the right, $\frac{5}{8}$ mile up Clover fork. Altitude of mouth, 1,140.

At the mouth of Stone Coal branch, $\frac{1}{2}$ mile up this fork, coal is taken from the creek and from the branch, exposing a considerable length of outcrop from which the following measurements were obtained:

Fire-clay Coal.

Sandstone.	
Coal	24"
Flint fire-clay.....	4 to 6"
Shale	6"
Sandstone.	
Altitude, 1215 to 1220.	

The bed rises quite sharply here up stream and against the prevailing northwest pitch, which, from the mouth of Clover fork to this point, amounts to nearly 100 feet.

Pebbles in quantity have been found $1\frac{1}{4}$ miles up in the Right fork, which seemed to have come from a soft sandstone at altitude 1,475. They have been found at the same horizon on Trace fork, of Cutshin creek.

On the left of a left branch, $1\frac{1}{2}$ miles up the Right fork, $\frac{1}{8}$ mile up the branch, coal has been opened to a reported thickness of 3 feet at altitude 1,565. It lies upon a small cliff and is of the Hazard bed or close beneath it.

On the left of a right branch at its mouth, 2 miles up the right fork, $\frac{1}{4}$ mile from the divide at the head of Laurel branch of Cutshin creek, a prospecting cut, now nearly covered, formerly gave the following:

Hazard Coal.

Shale	8 ft.
Coal	54"
Thin parting.	
Coal	12"
Altitude, 1565.	

Across the divide, on Laurel branch, an opening that may be of this bed but probably is the Flag, has coal 66 inches thick, 23 inches of which is cannel, at altitude 1585. The presence of cannel coal throws doubt on the

correlation as of the Hazard bed as it is not known to have it elsewhere.

Coal has been taken from Clover fork, $1\frac{1}{8}$ miles up, reported 2 feet or more thick, at altitude 1,205. This is probably of the Fire-clay coal bed.

On the left, and right of path, $1\frac{5}{8}$ miles up Clover fork, an incomplete opening gives, under earth covering, 31 inches of coal, partly splint, at altitude 1,330. This is the Hamlin coal bed.

On the left, $1\frac{3}{4}$ miles up Clover fork, the following section is exposed:

Section.

Shale	10 ft.
Coal	3"
Shale	4"
Coal	1"
Shale	3 ft.
Coal	8"
Altitude, 1350.	

On the left, $1\frac{7}{8}$ miles up Clover fork, on the right of Indian Grave branch at its mouth, 2 feet of coal is exposed on a cliff-rock at altitude 1,575. Ten feet above this exposure is an old opening with coal now covered, but workable thickness is indicated. This is not over 275 feet above the Fire-clay coal and is of the Hazard bed.

On the right of Lick branch at its mouth, $3\frac{1}{8}$ miles up Clover fork, on land of the Kentucky Union Land Company, the following section is opened:

Hazard Coal.

Shale	3 ft.
Coal	50"
Covered	10 ft.
Coal	2 to $2\frac{1}{2}$ ft.
Altitude of lower coal, 1615.	

The thin coal under the main bed establishes correlation with the coal on Indian Grave branch.

On the left, $7\frac{7}{8}$ miles up Leatherwood creek, 5 feet above it, coal has been opened in several entries giving

about 36 inches of coal, one entry only showing a parting hardly an inch thick. These are in the Amburgy bed at altitude 1,110. The down stream dip in evidence there is sufficiently rapid to carry the bed below the creek before reaching Clover fork, but the opening into the bed on that fork and evidence on Grave branch prove the rapid dip to be of short continuance. Farther up Leatherwood the bed must go below the creek very quickly.

LYNN BRANCH.

On the right, $8\frac{1}{8}$ miles up Leatherwood. Altitude of mouth, 1,115.

One-half mile up this branch it forks.

On the right, at the mouth of a left branch, $1\frac{1}{2}$ miles up the Right fork, a prospect into the Hazard bed gave 51 inches of coal (8 inches in water, not seen) with earth covering. About 4 inches of this is splint coal and the rest good block. Its altitude is 1,545. The ridge between this fork and the left fork is over 200 feet higher, giving abundant area.

The Left fork divides into two forks, $1\frac{1}{4}$ miles up it. On the right at the mouth of a left branch, $\frac{1}{2}$ mile up the second left fork, the following has been opened:

Hazard Coal.

Shaly sandstone	4 ft.
Shale	4 ft.
Coal	44"
Slaty coal	8"
Coal	8"
Altitude, 1615.	

The lower 7 inches in water, was not seen. The slaty coal is not very bad, but that with three thin streaks of bone coal, apparently not continuous, may mar considerably the quality of the coal. These two openings and most of the land on the two forks belong to the Kentucky Union Land Company.

OLDHOUSE BRANCH.

On the right, $8\frac{3}{4}$ miles up Leatherwood. Altitude of mouth, 1,155.

On the right of a small right branch at its mouth, $\frac{1}{2}$ mile up Oldhouse, on J. B. C. Cornett land, the top of an old opening showed:

Fire-clay Coal Rider.

Shale and clay	10 ft.
Coal	14"
Shale	10"
Coal	5"
Shale	2 ft.
Altitude, 1280.	

Some 4 to 6 feet of the opening below was covered, but in a private report to the Tennis Coal Company there is stated to be there 46 inches of fine bright coal (more or less of it soft coking coal). The thickness given is without doubt accurate, and the bed the Fire-clay coal, with its rider still visible above it.

On the left of the right fork of Oldhouse branch, a mile up from Leatherwood, an old entry with the bottom coal formerly covered still had visible 3 to $3\frac{1}{2}$ feet of coal with shaly sandstone roof. This, at altitude 1,625, is probably of the Hazard bed, the height above the Fire-clay coal down the branch being increased by an upstream rise of strata, but may be of the Flag.

On the left of the left fork, $1\frac{1}{2}$ miles from Leatherwood, William Shepard had a small entry into the same bed with section, and analysis by Dr. Peter, of my outcrop sample of the best of the coal following:

Hazard (or Flag) Coal.

Sandstone.	
Coal	62"
Shale	1"
Coal	2"
Shale	1"
Coal	2"
Shale	2"
Coal	4"
Altitude, 1640.	

Analysis.

Moisture	1.40
Volatile combustible matter	28.60
Fixed carbon	58.00
Ash (very light gray)	12.06
	100.00
Sulphur	0.958
Specific gravity	1.362
Coke	Dense

"A weathered sample of what appear to be bituminous and splint coals, which seem to be pretty pure."

The sample was taken from the lower 45 inches of the 62-inch seam, the upper 17 inches being too unsound for sampling at the time the sample was taken. The report, just quoted, to the Tennis Coal Company states that at no time in mining was more than 46 inches of coal used, the alternate coal and shale at the bottom providing a mining seam. The 46 inches of solid coal underground, which may be considered the true thickness, is a fine, bright coal, partly splint, which is evidently much purer than the high ash of the analysis gives for the outcrop coal.

The succession of openings near the heads of Lynn and Oldhouse branches give the impression of their being in one coal bed, which is probably correct, the change of the Oldhouse openings to sandstone roof conforming to that condition of the Hazard bed farther up the creek, but each of these Oldhouse openings is 20 to 30 feet below a prominent bench, a condition not usual with the Hazard bed and throwing doubt on the correlation.

STONY FORK.

On the right, 9 miles up Leatherwood creek. Altitude of mouth, 1,165.

On the left, $\frac{1}{4}$ mile up the fork, there is exposed in a cliff at water level, 9 inches of coal with 3 inches of black slate parting in the middle, at altitude 1,190, under 5 feet of shale and then 20 feet of sandstone.

BAKER (FORMERLY SMITH) BRANCH.—On the right, $\frac{5}{8}$ mile up Stony fork. Altitude of mouth, 1,255.

In a left drain, 1 mile up this branch, the Flag bed has been opened with 42 inches of splint coal without parting, a sandstone roof and altitude of 1,705.

On the right, $\frac{3}{4}$ mile up Stony fork, 20 feet above it, are the Friley Browning openings into the Fire-clay coal. In the 20 yards exposure, partly mined under roof, there is little variation in the upper coal seams and partings, but the bottom seam of coal varies from 30 to 41 inches in thickness, and in character from splint and block coal to the same and slickenseit.

Following is the bed section as measured at two places, and analyses of my sample of the bottom bench of this coal and of a specimen of the slickenseit, as determined by Dr. Peter:

Fire-clay Coal.

Shale	14 ft.	
Coal	7".....	6"
Shale	1".....	2"
Coal	6".....	6"
Shale	4".....	6"
Coal	5".....	5"
Shale	3".....	5"
Coal	41".....	30"
Altitude, 1285.		

Analyses.

	Lower Bench.	Slickenseit.
Moisture	1.40	1.44
Volatile combustible matter.....	28.20	38.06
Fixed carbon	53.90	54.90
Ash	16.50	5.60
	100.00	100.00
Sulphur	0.978	0.972
Specific gravity	1.799	1.276
Coke	Dense	Dense
Ash	Very light gray.	Nearly white.

Lower Bench.—Though taken from a muddy outcrop, Dr. Peter reports of this coal: "A pretty pure-looking sample. Breaking into thin irregular laminae, with some fibrous coal apparent, but no pyrites visible." The excessive ash cannot all be attributed to adhering mud, nor does a late view of the bed indicate a poor coal.

Slickenseit.—"Pitch-black, pure-looking coal. Fracture irregular. No fibrous coal or pyrite apparent."

It is worth noting that strata lie nearly level along Leatherwood creek from Grave branch to this point, as shown by openings of the Fire-clay coal bed.

What is perhaps the Hamlin coal, 105 feet above the Fire-clay coal, on Clover fork, has been opened 165 feet above the Browning entries with section as follows:

Sandstone.	
Cannel coal	9"
Shale and ore	13"
Cannel coal	7"
Clay	7"
Coal	12"
Black slate	3"
Altitude, 1450.	

It is possible that this is of the Haddix bed, with interval to the Fire-clay coal actually somewhat greater than the difference in height of the two openings indicates.

On the left, 2 miles up Stony fork, on the road to Line fork, behind James Morgan's house, the Hazard bed is opened in a nine-yard entry with about 50 inches of coal, the lower 9 inches in water when visited, at altitude 1,685. Splint and block coal were found there, some with irregular cleavage.

Along the creek for a quarter-mile above the Browning openings strata lie nearly level, but above the forks of Stony fork, on the road to Line fork, cliffs show a marked up-stream rise. The Haddix coal lies probably between the two most prominent cliffs.

On the left, $2\frac{1}{4}$ miles up the same fork is an entry into the Hazard bed probably, but possibly the Flag, under 3 feet of shale, with 52 inches or more of coal, the lower 4 inches in water, at altitude 1,715.

The road gap to Line fork is over 200 feet above this coal and Kentucky ridge rises to a height of some 600 feet above the coal, giving it a large area in this ridge.

An old prospect by the road on the Line fork side into the same bed as the next preceding, indicates about 4 feet of coal. The Haddix (or Hazard) coal shows a thin outcrop, 50 feet under it.

On the left, $9\frac{1}{2}$ miles up Leatherwood creek, $\frac{1}{2}$ mile above Stony fork, the following section is exposed at the creek, showing a slight southwesterly dip to the similar exposure, $\frac{1}{4}$ mile up Stony fork:

Section.

Thin-bedded sandstone.		
Sandy shale	4 ft.	
Coal	4"	} Altitude, 1200.
Black shale	2"	
Splint coal	5"	
Fire-clay.		
Shaly sandstone and shale to creek.....	15 ft.	

An old opening directly above this exposure is said to have the flint fire-clay at the bottom. An earlier visit gave the following section:

Fire-clay Coal.

Sandstone.	
Coal	6"
Shale	20 ft.
Cannel coal	16"
Shale	3"
Coal	3"
Shale	10"
Clay	6"
Thin-bedded sandstone.	
Altitude, 1280.	

This is, doubtless, of the Fire-clay coal bed, though the clay at the bottom does not appear to be flint clay. Its altitude is strong proof of the correlation.

BEECH ROCK BRANCH.

On the left, $10\frac{1}{2}$ miles up Leatherwood. Altitude of mouth, 1,330.

The following section was taken mostly in the bed of the branch, $\frac{1}{8}$ to $\frac{1}{4}$ mile up it:

Section.

Massive sandstone (somewhat argillaceous) ..	20 ft.	
Shale	8"	
Coal	3"	
Shale with small concretions	$1\frac{1}{2}$ to $2\frac{1}{2}$ ft.	
Coal	18"	
Coal, clay and bituminous shale	2 to 3 ft.	Altitude, 1470.
Clay	4 ft.	
Shaly sandstone (concretionary boulders in the middle)	45 ft.	
Covered	5 ft.	
Sandy shale (with small concretions)	3 ft.	
Covered	4 ft.	
Shaly sandstone	3 ft.	
Bastard limestone	3 ft.	
Shaly sandstone	2 ft.	
Shale	5 ft.	
Coal	12"	
Shale	1"	
Coal	6"	Altitude, 1400.

These coals appear to be of the Hamlin bed and Fire-clay coal rider.

On the right, $11\frac{1}{4}$ miles up Leatherwood, George Minyard has a ten-yard wet entry into the Flag bed shewing about 4 feet of coal, 6 inches in water, at altitude 1,785.

BARK-CAMP BRANCH.

On the right, $11\frac{1}{2}$ miles up Leatherwood. Altitude of mouth, 1,430.

Correlations of coals on this branch and of the high coals on Stony fork are not yet satisfactorily determined although special effort was made for that purpose. The writer now believes that those openings formerly ascribed doubtfully to the Haddix and Hazard beds are of the Hazard and Flag beds and so designates them now. It has been questioned if they may not be of still higher

beds, but this seems to him to be highly improbable and all but proven not to be the case by the openings on Bee Hive branch described on preceding pages.

This in spite of the fact that it involves either a break or considerable anticline along Kentucky ridge in this vicinity, possibly an extension of the "adjustment fault" extending from the head of Line fork to near the heads of Jakes and Stony forks. (See Series IV., Vol. IV., Part 1, p. 14.) A large increase in thickness of sandstone over the Haddix coal is also indicated in the report referred to.

On the left, $\frac{1}{8}$ mile up this branch, $11\frac{1}{2}$ feet of coal of the rider, at altitude 1,470, shows under 20 feet of shaly sandstone.

On the right, $\frac{1}{4}$ mile up the branch, John Horn has a prospect cut into the Flag bed driven to solid cover, showing 49 inches of good splint and block coal, the lower 18 inches probably splint, under 6 feet of shale with 20 feet of massive sandstone on that. The altitude of the opening is 1,800. A 30-foot cliff is exposed 10 feet below the opening and the top of a more prominent one is 80 feet below the coal.

On the left, $\frac{3}{8}$ mile up the branch, at its level, an entry is driven into a coal bed showing $21\frac{1}{2}$ feet of coal including two thin partings. Its altitude is 1,505. Here the coal is in part slickenseit as in the Fire-clay coal of Stony fork. The bed is probably the rider.

On the right, $\frac{3}{4}$ mile up the branch, L. Shepard has a new opening giving the following bed section:

Hazard Coal.

Earth.	
Coal	54"
Clay	11"
Coal	1"
Clay	4"
Coal	2"
Altitude, 1760.	

Carbonate iron ore lies about 15 feet below the coal, a not uncommon occurrence under the Hazard bed.

An attempt was made to open the same bed on the opposite side of the branch, but failed of getting satis-

factory thickness, probably because of broken rock in the way.

On the right, 1 mile up the branch, E. R. Whittaker has a twenty-five-yard entry giving the section following:

Hazard Coal.

Shale	10 ft.
Coal	8"
Shale	1½ ft.
Coal (about)	79"
Altitude, 1775.	

About 2 feet of coal in the bottom is not used. Some of it is slickenseit and it is said not to be suitable for welding. The upper part of the two feet seemed to be a sort of rash coal, but with 1½ feet of water at the mouth of the entry it was not fully investigated.

On the right, 1½ miles up the branch, Eli Whittaker has a closed entry into the Hazard bed, 75 feet above the branch, showing, under sandstone, about 3 feet of coal, including one foot under water, at altitude 1,790. An opening on the left of the branch is entirely closed.

The gap to Long branch, of Line fork, is 2 miles up Bark-Camp branch, and its altitude is 1,974, giving over 100 feet of covering to the Flag bed, and several hundred feet more on Kentucky ridge away from the gap.

The Haddix (?) coal is opened 1¼ miles down Long branch, under 5 feet of shale, with coal reported 9 feet thick including three partings aggregating 16 inches. Its altitude is 1,592. An entry into the Fire-clay coal, 1¾ miles down Long branch, gives about 3 feet of coal with flint clay parting, 200 feet below the Haddix opening.

On the left, 11⅝ miles up Leatherwood creek, ⅙ mile above Bark-Camp branch, is exposed the following, the coal being probably the rider:

Sandstone.	
Shale	10 ft.
Coal and thin parting	1½ ft.
Shale (to creek level)	25 ft.
Altitude,	1465.

On the right, 11¾ miles up Leatherwood, W. R. Shepard has a wet entry into the Flag bed, under soft sandstone, having about 4 feet of coal, at altitude 1,805. A 20-foot cliff lies immediately below it.

From this point the same rock can be seen in a cliff across the creek, and below it, under the Haddix (?) coal another line of cliffs dipping rapidly down stream from the mouth of Bark-Camp branch, while above that branch it lies nearly level, possibly with a slight upstream dip. The top of the cliff under the Hazard (?) coal is at altitude 1,780, in the vicinity of an old Hazard coal opening, on a left branch 13 miles up Leatherwood creek.

ANALYSES.

The coals from the following mines were sampled and analyzed by the Kentucky Geological Survey and the United States Bureau of Mines acting in co-operation. The analyses were made in the laboratories of the Bureau of Mines.

In each mine the coal was sampled in different parts of the mine, each sample analyzed separately and a composite analysis then made of all for each mine. The results are given on the following pages, the composite analyses giving both proximate and ultimate analysis for the coal from the corresponding mine.

J. B. HOEING.

PERRY COUNTY.

No. 1-a.

Laboratory number 21,350
 Operator Ashless Coal Corporation
 Mine Ashless
 Location Lothair
 Location in mine Face of No. 2 main entry
 Coal Fire-clay. (Local No. 4)
 Date of sampling 2-27-1915
 Date of analysis 3-23-1915

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	40	
Immediate Roof—Sandy slate	2	6
1. Coal		10
2. Sulphur streak (local)		5
3. Coal		$\frac{1}{2}$
4. Mother coal		
5. Coal	2	2
6. Hard coal (bony)		4
7. Coal		2
Total	3	11 $\frac{1}{2}$
Floor—clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.0		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.85	3.81		
	Volatile matter	36.85	36.11	37.54	39.18
	Fixed carbon	57.20	56.06	58.28	60.82
	Ash	4.10	4.02	4.18	
		100.00	100.00	100.00	100.00
Sulphur		0.70	0.69	0.72	0.75
Calorific Value Determined	Calories	7810	7654	7957	8304
	B. T. U.	14058	13777	14323	14947

No. 1-b.

Laboratory number	21,352
Operator	Ashless Coal Corporation
Mine	Ashless
Location	Lothair
Location in mine.....	Face 2nd right entry, 550 feet from opening.
Coal.....	Fire-clay. (Local No. 4)
Date of sampling	3-8-1915
Date of analysis	3-23-1915
Depth below surface	150 feet

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		
1. Coal	1	2
2. Hard coal		1
3. Coal		2
4. Mother coal		$\frac{1}{2}$
5. Coal		11
6. Hard coal		4
7. Coal		9
8. Hard coal		1
9. Coal		9
Total	4	$3\frac{1}{2}$
Floor—flint fire-clay.		
Excluded from sample, none.		

Air-dry Loss, 2.6		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.68	4.20	-----	-----
	Volatile matter ..	36.72	35.78	37.35	40.18
	Fixed carbon	54.68	53.28	55.61	59.82
	Ash	6.92	6.74	7.04	-----
		100.00	100.00	100.00	100.00
Sulphur		0.65	0.63	0.66	0.71
Calorific Value Determined	Calories	7570	7376	7699	8282
	B. T. U.....	13626	13277	13858	14908

PERRY COUNTY.

No. 1-c.

Laboratory number 21,351
 Operator Ashless Coal Corporation
 Mine Ashless
 Location Lothair
 Location in mine Face 2nd left entry,
 500 feet from opening.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 3-8-1915
 Date of analysis 3-23-1915
 Depth below surface 170 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		
1. Coal	1	1
2. Hard coal		1
3. Coal	2	2
4. Hard coal		1
5. Coal		7
Total	4	0
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.6		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.70	4.30	.....	.....
	Volatile matter ..	37.55	36.56	38.21	40.46
	Fixed carbon	55.30	53.83	56.24	59.54
	Ash	5.45	5.31	5.55	.....
		100.00	100.00	100.00	100.00
Sulphur		0.75	0.73	0.76	0.80
Calorific Value Determined	Calories	7716	7512	7849	8311
	B. T. U.....	13889	13522	14128	14960

PERRY COUNTY.

No. 1-d.

Laboratory number 21,349
 Operator Ashless Coal Corporation
 Mine Ashless
 Location Lothair
 Location in mine.....Face main entry No. 1 mine,
 700 feet from drift mouth.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 2-27-1915
 Date of analysis 3-23-1915
 Depth below surface 95 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	20	
Immediate Roof—Gray slate	2	6
1. Coal	1	2
2. Mother coal		$\frac{1}{2}$
3. Coal	2	8
4. Hard coal (bony)		4
5. Coal		4
Total	4	$6\frac{1}{2}$
Floor—fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.3		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.90	4.11	.....	.....
	Volatile matter ..	37.15	36.31	37.87	39.85
	Fixed carbon	56.08	54.82	57.17	60.15
	Ash	4.87	4.76	4.96	.....
		100.00	100.00	100.00	100.00
Sulphur		0.62	0.61	0.64	0.67
Calorific Value Determined	Calories	7758	7583	7908	8321
	B. T. U.....	13964	13649	14234	14978

PERRY COUNTY.

No. 1-e.

Laboratory number 21,353F
(Composite of 21,349-50-51-52.)

Operator Ashless Coal Corporation
Mine Ashless
Location Lothair
Coal Fire-clay. (Local No. 4)
Date of sampling 2-27-1911
Date of analysis 3-23-1915

ANALYSIS.

Air-dry Loss, 2.4		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.84	4.16	.....	.....
	Volatile matter ..	37.49	36.61	38.20	40.41
	Fixed carbon	55.30	53.99	56.33	59.59
	Ash	5.37	5.24	5.47	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.40	5.53	5.29	5.60
	Carbon	78.34	76.49	79.81	84.43
	Nitrogen	1.74	1.70	1.77	1.87
	Oxygen	8.50	10.41	7.00	7.40
	Sulphur	0.65	0.63	0.66	0.70
	Ash	5.37	5.24	5.47	.....
Calorific Value Determined	Calories	7710	7528	7855	8310
	B. T. U.....	13878	13550	14139	14958
Calorific Value Calculated From Ultimate Analysis	Calories .....	.....	7652	.....	.....
	B. T. U.....	.....	13774	.....	.....

PERRY COUNTY.

No. 2-a.

Laboratory number 21,354
 Operator Douglass Coal Mining Co.
 Mine Douglass
 Location Douglass
 Location in mine.....Face of room 4, off 2nd right entry,
 500 feet in.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 3-8-1915
 Date of analysis 3-20-1915
 Depth below surface 110 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		
1. Coal		8½
2. Mother coal and sulphur mixed.....		½
3. Coal		10
4. Hard coal		2
5. Coal	1	2
Total	2	11
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.9		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.85	3.75	.....	.....
	Volatile matter ..	36.95	36.23	37.64	39.28
	Fixed carbon	57.10	56.00	58.18	60.72
	Ash	4.10	4.02	4.18	.....
		100.00	100.00	100.00	100.00
Sulphur		0.67	0.66	0.69	0.72
Calorific Value Determined	Calories	7838	7686	7986	8334
	B. T. U.....	14108	13835	14375	15001

PERRY COUNTY.

No. 2-b.

Laboratory number 21,355
 Operator Douglass Coal Mining Co.
 Mine Douglass
 Location Douglass
 Location in mine.....Face of 2nd entry right,
 600 feet in.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 3-8-1915
 Date of analysis 3-24-1915
 Depth below surface 120 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone		
Immediate Roof—Sandstone		
1. Coal		10
2. Hard coal		2
3. Coal		10
4. Hard coal		2
5. Coal		10
Total	2	10
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.7		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.90	3.61	.....	.....
	Volatile matter ..	38.45	37.78	39.20	40.52
	Fixed carbon	56.45	55.47	57.54	59.49
	Ash	3.20	3.14	3.26	.....
		100.00	100.00	100.00	100.00
Sulphur		0.88	0.86	0.89	0.92
Calorific Value Determined	Calories	7934	7796	8088	8361
	B. T. U.	14281	14033	14558	15050

PERRY COUNTY.

No. 2-c.

Laboratory number 21,356
 Operator Douglass Coal Mining Co.
 Mine Douglass
 Location Douglass
 Location in mine Face of 3rd right entry
 Coal Fire-clay. (Local No. 4)
 Date of sampling 2-26-1915
 Date of analysis 3-24-1915
 Depth below surface 120 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	20	
Immediate Roof—Gray Slate	2	6
1. Coal	3	3
Total	3	3
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.3		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.05	3.29	.....	.....
	Volatile matter ..	38.30	37.81	39.10	40.27
	Fixed carbon	56.80	56.09	57.99	59.73
	Ash	2.85	2.81	2.91	.....
		100.00	100.00	100.00	100.00
Sulphur		0.66	0.65	0.67	0.69
Calorific Value Determined	Calories	7933	7832	8098	8341
	B. T. U.....	14279	14098	14576	15014

PERRY COUNTY.

No. 2-d.

Laboratory number 21,358F
 (Composite of 21354-5-6-7.)
 Operator Douglass Coal Mining Co.
 Mine Douglass
 Location Douglass
 Coal Fire-clay. (Local No. 4)
 Date of sampling 2-26-1915
 Date of analysis 3-26-1915

ANALYSIS.

Air-dry Loss, 1.7		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.92	3.61	.....	.....
	Volatile matter ..	37.73	37.08	38.47	39.87
	Fixed carbon	56.91	55.93	58.02	60.13
	Ash	3.44	3.38	3.51	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.51	5.61	5.41	5.61
	Carbon	80.16	78.78	81.73	84.70
	Nitrogen	1.74	1.71	1.77	1.83
	Oxygen	8.43	9.81	6.84	7.09
	Sulphur	0.72	0.71	0.74	0.77
	Ash	3.44	3.38	3.51	.....
Calorific Value Determined	Calories	7904	7768	8059	8352
	B. T. U.....	14227	13982	14506	15034
Calorific Value Calculated From Ultimate Analysis	Calories .....	.....	7891	.....	.....
	B. T. U.....	.....	14204	.....	.....

PERRY COUNTY.

No. 3-a.

Laboratory number 21,364
 Operator Hazard Mining Co.
 Mine Hazard
 Location Hazard
 Location in mine.....Face of 3rd right,
 1,800 feet from opening.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 2-24-1915
 Date of analysis 3-27-1915
 Depth below surface 125 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	16	
Immediate Roof—Gray Shale	2	6
1. Coal	2	0
2. Mother coal		$\frac{1}{8}$
3. Coal	1	0
Total	3	$0\frac{1}{8}$
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.9		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	1.85	3.71	.....	.....
	Volatile matter ..	38.05	37.33	38.77	40.06
	Fixed carbon	56.95	55.87	58.02	59.94
	Ash	3.15	3.09	3.21	.....
		100.00	100.00	100.00	100.00
Sulphur		0.66	0.65	0.68	0.70
Calorific Value Determined	Calories	7905	7756	8055	8322
	B. T. U.....	14229	13961	14499	14980

PERRY COUNTY.

No. 3-b.

Laboratory number	21,365
Operator	Hazard Mining Co.
Mine	Hazard
Location	Hazard
Location in mine	Face of 1st west, 1,200 feet from opening.
Coal	Fire-clay. (Local No. 4)
Date of sampling	3-24-1915
Date of analysis	3-27-1915
Depth below surface	125 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	15	
Immediate Roof—Gray Shale	2	6
1. Coal (all clean)	3	3
Total	3	3
Floor—fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.5		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.03	3.49	.....	.....
	Volatile matter ..	38.07	37.50	38.86	40.48
	Fixed carbon	55.98	55.15	57.14	59.52
	Ash	3.92	3.86	4.00	.....
		100.00	100.00	100.00	100.00
Sulphur		0.60	0.59	0.61	0.64
Calorific Value Determined	Calories	7837	7720	7999	8333
	B. T. U.....	14107	13896	14398	14998

PERRY COUNTY.

No. 3-c.

Laboratory number 21,366
 Operator Hazard Mining Co.
 Mine Hazard
 Location Hazard
 Location in mine.....Face of 2nd right entry,
 1,800 feet from mouth of mine.
 Coal Fire-clay. (Local No. 4)
 Date of sampling.....3-10-1915
 Date of analysis 3-27-1915
 Depth below surface.....160 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		
1. Coal	2	6
2. Hard coal		2
3. Coal		6
Total	3	2
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.07	3.81		
	Volatile matter ..	37.48	36.81	38.27	39.74
	Fixed carbon	56.82	55.81	58.02	60.26
	Ash	3.63	3.57	3.71	
		100.00	100.00	100.00	100.00
Sulphur		0.58	0.57	0.59	0.61
Calorific Value Determined	Calories	7843	7703	8008	8316
	B. T. U.....	14117	13865	14414	14969

PERRY COUNTY.

No. 3-d.

Laboratory number 21,367F

(Composite of 21364-5-6.)

Operator Hazard Mining Co.

Mine Hazard

Location Hazard

Coal Fire-clay. (Local No. 4)

Date of sampling 2-24-1915

Date of analysis 3-27-1915

ANALYSIS.

Air-dry Loss, 1.7		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.10	3.78	.....	.....
	Volatile matter ..	37.55	36.90	38.34	39.81
	Fixed carbon	56.77	55.80	58.00	60.19
	Ash	3.58	3.52	3.66	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.46	5.56	5.34	5.54
	Carbon	79.13	77.77	80.83	83.89
	Nitrogen	1.79	1.76	1.83	1.90
	Oxygen	9.37	10.73	7.65	7.96
	Sulphur	0.67	0.66	0.69	0.71
	Ash	3.58	3.52	3.66	.....
Calorific Value Determined	Calories	7868	7733	8037	8342
	B. T. U.....	14162	13919	14467	15016
Calorific Value Calculated From Ultimate Analysis	Calories .....	.....	7753	.....	.....
	B. T. U.....	.....	13955	.....	.....

PERRY COUNTY.

No. 4a.

Laboratory number 21,368
 Operator Hazard-Dean Coal Co.
 Mine Hazard-Dean
 Location 1 mile S. W. of Hazard
 Location in mine.....Face of main No. 1,
 900 feet from drift mouth.
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling 3-1-1915
 Date of analysis 3-25-1915
 Depth below surface 250 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	—
Immediate Roof—Shaly Sandstone	2	6
1. Coal	2	2
2. Bone	—	1
3. Coal	1	1
Total	3	4
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.3		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.22	4.46	—	—
	Volatile matter ..	37.08	36.23	37.92	39.67
	Fixed carbon	56.37	55.08	57.66	60.33
	Ash	4.38	4.23	4.42	—
		100.00	100.00	100.00	100.00
Sulphur		0.89	0.87	0.91	0.95
Calorific Value Determined	Calories	7751	7574	7928	8294
	B. T. U.....	13952	13633	14270	14929

PERRY COUNTY.

No. 4-b.

Laboratory number 21,370
 Operator Hazard-Dean Coal Co.
 Mine Hazard-Dean
 Location 1 mile S. W. of Hazard
 Location in mine Face of 2nd right entry,
 900 feet from mouth of mine.
 Coal Fire-clay. (Local No. 4)
 Date of sampling 3-10-1915
 Date of analysis 3-29-1915
 Depth below surface 150 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	25	
Immediate Roof—Sandstone		
1. Coal	1	1½
2. Mother coal		½
3. Coal	1	6
4. Hard coal		1
5. Coal		7
6. Flint fire-clay		6
7. Coal		7
Total	4	5
Floor—flint fire-clay left in.		
Excluded from sample, Nos. 5 and 6.		

ANALYSIS.

Air-dry Loss, 1.7		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.10	3.74		
	Volatile matter	37.60	36.97	38.41	40.11
	Fixed carbon	56.15	55.21	57.35	59.89
	Ash	4.15	4.08	4.24	
		100.00	100.00	100.00	100.00
Sulphur		0.58	0.57	0.59	0.61
Calorific Value Determined	Calories	7789	7658	7956	8309
	B. T. U.	14020	13784	14321	14956

PERRY COUNTY.

No. 4-c.

Laboratory number 21,369
 Operator Hazard-Dean Coal Co.
 Mine Hazard-Dean
 Location 1 mile S. W. of Hazard
 Location in mine Face of main No. 2,
 500 feet from drift mouth.
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling 3-1-1915
 Date of analysis 3-29-1915
 Depth below surface 200 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	35	
Immediate Roof—Shaly Sandstone	2	6
1. Coal	1	10
2. Bone		1
3. Coal	1	4
Total	3	3
Floor—flint fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 1.6		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.03	3.57		
	Volatile matter	38.47	37.87	39.27	40.82
	Fixed carbon	55.78	54.90	56.93	59.18
	Ash	3.72	3.66	3.80	
		100.00	100.00	100.00	100.00
Sulphur		0.78	0.77	0.80	0.83
Calorific Value Determined	Calories	7829	7706	7991	8307
	B. T. U.	14090	13871	14384	14953

PERRY COUNTY.

No. 4-d.

Laboratory number 21,371
 Operator Hazard-Dean Coal Co.
 Mine Hazard-Dean
 Location 1 mile S. W. of Hazard
 Location in mine.....Face of 2nd left entry,
 950 feet from mouth of mine.
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling 3-10-1915
 Date of analysis.....3-29-1915
 Depth below surface 175 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Shaly Sandstone	1	6
1. Coal	2	9
2. Hard coal		1
3. Coal		6
4. Flint fire-clay		6
5. Coal		7
Total	4	5
Floor—flint fire-clay left in.		
Excluded from sample, Nos. 4 and 5.		

ANALYSIS.

Air-dry Loss, 1.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.15	3.93	.....	.....
	Volatile matter ..	38.25	37.55	39.09	40.60
	Fixed carbon	55.95	54.94	57.19	59.40
	Ash	3.65	3.58	3.72	.....
		100.00	100.00	100.00	100.00
Sulphur		0.69	0.68	0.71	0.74
Calorific Value Determined	Calories	7831	7688	8002	8311
	B. T. U.....	14096	13838	14404	14960

PERRY COUNTY.

No. 4-e.

Laboratory number 21,372
 (Composite of 21368-69-70-71.)
 Operator Hazard-Dean Coal Co.
 Mine Hazard-Dean
 Location 1 mile S. W. of Hazard
 Coal Fire-clay. (Local No. 1)
 Date of sampling.....3-1-1915
 Date of analysis 3-29-1915

ANALYSIS.

Air-dry Loss, 1.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.10	3.90	.....	.....
	Volatile matter ..	37.68	36.99	38.49	40.13
	Fixed carbon	56.22	55.18	57.42	59.87
	Ash	4.00	3.93	4.09	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.43	5.53	5.31	5.54
	Carbon	78.53	77.09	80.22	83.64
	Nitrogen	1.65	1.62	1.69	1.76
	Oxygen	9.64	11.09	7.92	8.26
	Sulphur	0.75	0.74	0.77	0.80
	Ash	4.00	3.93	4.09	.....
Calorific Value Determined	Calories	7800	7656	7967	8306
	B. T. U.....	14040	13781	14341	14951
Calorific Value Calculated From Ultimate Analysis	Calories .....	.....	7672	.....	.....
	B. T. U.....	.....	13810	.....	.....

PERRY COUNTY.

No. 5-a.

Laboratory number 21,334
 Operator Himyar Coal Corporation
 Mine Himyar
 Location Domino
 Location in mine.....Face of 2nd entry on left,
 800 feet to drift mouth.
 Coal.....Hazard. (Local No. 6)
 Date of sampling.....2-15-1915
 Date of analysis 4-5-1915
 Depth below surface 120 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	20	0
Immediate Roof—Gray Slate	2	0
1. Coal .....	.....	2
2. Slate .....	.....	2
3. Coal .....	.....	8
4. Gray shale .....	.....	$\frac{1}{2}$
5. Coal	1	2
6. Bony coal .....	.....	1
7. Coal	2	2
8. Bony coal .....	.....	3
9. Coal .....	.....	10
Total	5	$6\frac{1}{2}$
Floor—fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 3.6		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.54	6.07	.....	.....
	Volatile matter ..	36.31	35.00	37.26	39.76
	Fixed carbon	55.01	53.01	56.44	60.24
	Ash	6.14	5.92	6.30	.....
		100.00	100.00	100.00	100.00
Sulphur		0.63	0.61	0.65	0.69
Calorific Value Determined	Calories	7531	7258	7727	8246
	B. T. U.....	13556	13064	13909	14843

PERRY COUNTY.

No. 5-b.

Laboratory number 21,337
 Operator Himyar Coal Corporation
 Mine Himyar
 Location Domino
 Location in mine Face of No. 2 main entry,
 700 feet from opening.
 Coal.....Hazard. (Local No. 6)
 Date of sampling 3-9-1915
 Date of analysis 4-5-1915
 Depth below surface 200 feet

SECTION OF MINE.

	Feet	Inches
Roof		
Immediate Roof—Coal		10
1. Slate		1
2. Coal		7
3. Hard coal		4½
4. Coal	1	4
5. Dirt (mostly coal)		3
6. Coal	1	5
7. Hard coal		4
8. Coal		4
Total	5	6½
Floor—clay.		
Excluded from sample, No. 1.		

ANALYSIS.

Air-dry Loss, 3.2		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.36	5.50	.....	.....
	Volatile matter ..	35.74	34.59	36.60	40.52
	Fixed carbon	52.45	50.76	53.72	59.48
	Ash	9.45	9.15	9.68	.....
		100.00	100.00	100.00	100.00
Sulphur		1.19	1.15	1.22	1.35
Calorific Value Determined	Calories	7214	6982	7388	8180
	B. T. U.....	12985	12568	13298	14724

PERRY COUNTY.

No. 5-c.

Laboratory number 21,336
 Operator Himyar Coal Corporation
 Mine Himyar
 Location Domino
 Location in mine.....Face of 1st left off No. 2 main
 550 feet from opening.
 Coal.....Hazard. (Local No. 6)
 Date of sampling 3-9-1915
 Date of analysis 3-22-1915
 Depth below surface 200 feet

SECTION OF MINE.

	Feet	Inches
Roof		
Immediate Roof—Coal		10
1. Slate		1
2. Coal		2
3. Hard coal		1
4. Coal		7
5. Hard coal		3
6. Coal	1	2
7. Dirt (mostly coal)		3
8. Coal	1	2
9. Hard coal		3
10. Coal	1	3
Total	6	1
Floor—clay.		
Excluded from sample, No. 1.		

ANALYSIS.

Air-dry Loss, 2.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.26	5.00	.....	.....
	Volatile matter ..	36.09	35.08	36.93	40.26
	Fixed carbon	53.55	52.05	54.79	59.74
	Ash	8.10	7.87	8.28	.....
		100.00	100.00	100.00	100.00
Sulphur		0.68	0.66	0.69	0.75
Calorific Value Determined	Calories	7359	7153	7529	8209
	B. T. U.....	13246	12875	13552	14776

PERRY COUNTY.

No. 5-d.

Laboratory number 21,335
 Operator Himyar Coal Corporation
 Mine Himyar
 Location Domino
 Location in mine Face of 1st right entry,
 500 feet from month.
 Coal.....Hazard. (Local No. 6)
 Date of sampling 2-2-1915
 Date of analysis 3-22-1915

ANALYSIS.

Air-dry Loss, 2.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.24	4.94	.....	.....
	Volatile matter ..	35.16	34.19	35.96	39.94
	Fixed carbon	52.86	51.40	54.08	60.06
	Ash	9.74	9.47	9.96	.....
		100.00	100.00	100.00	100.00
Sulphur		0.60	0.58	0.61	0.68
Calorific Value Determined	Calories	7225	7026	7391	8208
	B. T. U.....	13005	12647	13304	14774

PERRY COUNTY.

No. 5-e.

Laboratory number 21,338F
 (Composite of 21384-5-6-7.)
 Operator Himyar Coal Corporation
 Mine Himyar
 Location Domino
 Coal.....Hazard. (Local No. 6)
 Date of sampling 3-9-1915
 Date of analysis 3-22-1915

ANALYSIS.

Air-dry Loss, 3.1		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.30	5.33	.....	.....
	Volatile matter ..	36.00	34.88	36.84	40.28
	Fixed carbon	53.36	51.71	54.63	59.72
	Ash	8.34	8.08	8.53	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.18	5.36	5.04	5.51
	Carbon	74.79	72.47	76.55	83.69
	Nitrogen	1.60	1.55	1.64	1.79
	Oxygen	9.33	11.80	7.46	8.16
	Sulphur	0.76	0.74	0.78	0.85
	Ash	8.34	8.08	8.53	.....
Calorific Value Determined	Calories	7342	7114	7515	8216
	B. T. U.....	13216	12805	13527	14789
Calorific Value Calculated From Ultimate Analysis	Calories .....	.....	7209	.....	.....
	B. T. U.....	.....	12976	.....	.....

PERRY COUNTY.

No. 6-a.

Laboratory number 21,344
 Operator..... Kentucky Jewel Mining Co.
 Mine Kentucky Jewel
 Location..... $\frac{3}{4}$ mile N. E. of Lothair
 Location in mine..... Face of No. 3 main entry,
 600 feet in.
 Coal..... Flag. (Local No. 7)
 Date of sampling 3-8-1915
 Date of analysis 3-26-1915
 Depth below surface..... 210 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		
1. Coal		7
2. Hard coal		1
3. Coal		10
4. Mother coal		$\frac{1}{2}$
5. Coal	1	0
6. Hard coal		5
7. Coal		7
8. Hard coal		2
9. Coal		6
Total	4	$2\frac{1}{2}$
Floor—clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.16	4.90	.....	.....
	Volatile matter ..	35.49	34.50	36.28	39.36
	Fixed carbon	54.69	53.15	55.89	60.64
	Ash	7.66	7.45	7.83	.....
		100.00	100.00	100.00	100.00
Sulphur		0.80	0.78	0.82	0.89
Calorific Value Determined	Calories	7464	7255	7629	8277
	B. T. U.....	13435	13059	13732	14899

PERRY COUNTY.

No. 6-b.

Laboratory number 21,347
 Operator.....Kentucky Jewel Mining Co.
 Mine Kentucky Jewel
 Location..... $\frac{3}{4}$ mile N. E. of Lothair
 Location in mine.....Head of 5th entry,
 400 feet from mouth of drift.
 Coal.....Flag. (Local No. 7)
 Date of sampling.....2-27-1915
 Date of analysis.....3-26-1915

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone		
Immediate Roof—Sandstone		
1. Coal	1	0
2. Bone		2
3. Coal	1	8
4. Bone		3
5. Coal		1
6. Bone		1
7. Coal		6
8. Bone		3
Total	4	0
Floor—fire-clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.2		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.15	4.31	.....	.....
	Volatile matter ..	35.20	34.42	35.97	39.69
	Fixed carbon	53.47	52.29	54.65	60.31
	Ash	9.18	8.98	9.38	.....
		100.00	100.00	100.00	100.00
Sulphur		0.79	0.77	0.80	0.88
Calorific Value Determined	Calories	7336	7174	7497	8273
	B. T. U.....	13205	12913	13495	14891

PERRY COUNTY.

No. 6-c.

Laboratory number 21,346
 Operator..... Kentucky Jewel Mining Co.
 Mine Kentucky Jewel
 Location..... $\frac{3}{4}$ mile N. E. of Lothair
 Location in mine..... Head of first entry,
 1,400 feet from mouth of drift.
 Coal..... Flag. (Local No. 7)
 Date of sampling 2-27-1915
 Date of analysis 3-23-1915

SECTION OF MINE.

	Feet	Inches
RooF—Sandstone		
Immediate RooF—Sandstone		
1. Coal		9
2. Bone		4
3. Coal		9
4. Mother coal		1
5. Coal	1	1
6. Bone		3
7. Coal	1	0
Total	4	3
Floor—clay.		
Excluded from sample, none.		

ANALYSIS.

Air-dry Loss, 2.9		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.14	5.00	.....	.....
	Volatile matter ..	36.86	35.87	37.66	40.40
	Fixed carbon	54.37	52.78	55.56	59.60
	Ash	6.63	6.44	6.78	.....
		100.00	100.00	100.00	100.00
Sulphur		0.96	0.93	0.98	1.05
Calorific Value Determined	Calories	7562	7341	7727	8289
	B. T. U.....	13612	13214	13909	14920

PERRY COUNTY.

No. 6-d.

Laboratory number	21,345
Operator.....	Kentucky Jewel Mining Co.
Mine	Kentucky Jewel
Location.....	$\frac{3}{4}$ mile N. E. of Lothair
Location in mine	Face of No. 4 main entry, 500 feet from opening.
Coal.....	Flag. (Local No. 7)
Date of sampling.....	3-8-1915
Date of analysis.....	3-23-1915
Depth below surface.....	200 feet

SECTION OF MINE.

		Feet	Inches
Roof—Sandstone		25	
Immediate Roof—Sandstone			
1.	Coal	1	1
2.	Hard coal		2½
3.	Coal	1	9
4.	Hard coal		4
5.	Coal		4
6.	Hard coal		4½
7.	Coal		2
Total		4	3
Floor—clay.			
Excluded from sample, none.			

ANALYSIS.

Air-dry Loss, 2.0		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.05	4.00	.....	.....
	Volatile matter ..	37.35	36.61	38.14	40.60
	Fixed carbon	54.65	53.56	55.97	59.40
	Ash	5.95	5.83	6.07	.....
		100.00	100.00	100.00	100.00
Sulphur		0.69	0.68	0.71	0.76
Calorific Value Determined	Calories	7646	7494	7806	8310
	B. T. U.....	13763	13489	14051	14958

PERRY COUNTY.

No. 6-e.

Laboratory number 21,348F

(Composite of 21344-5-6-7.)

Operator.....Kentucky Jewel Mining Co.

Mine Kentucky Jewel

Location..... $\frac{3}{4}$ mile N. E. of Lothair

Coal.....Flag. (Local No. 7)

Date of sampling.....2-27-1915

Date of analysis.....3-23-1915

ANALYSIS.

Air-dry Loss, 2.5		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.10	4.53	-----	-----
	Volatile matter ..	36.28	35.38	37.06	40.08
	Fixed carbon	54.24	52.89	55.40	59.92
	Ash	7.38	7.20	7.54	-----
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.22	5.37	5.10	5.52
	Carbon	75.73	73.85	77.35	83.65
	Nitrogen	1.67	1.63	1.71	1.84
	Oxygen	9.25	11.22	7.54	8.17
	Sulphur	0.75	0.73	0.76	0.82
	Ash	7.38	7.20	7.54	-----
Calorific Value Determined	Calories	7509	7323	7670	8295
	B. T. U.....	13516	13181	13806	14931
Calorific Value Calculated From Ultimate Analysis	Calories	-----	7352	-----	-----
	B. T. U.....	-----	13234	-----	-----

PERRY COUNTY.

No. 7-a.

Laboratory number 21,359
 Operator.....North Fork Coal Co.
 Mine North Fork
 Location Lennut
 Location in mine.....Face of 1st left entry,
 700 feet from drift mouth.
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling.....2-25-1915
 Date of analysis.....3-24-1915

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Gray Slate	2	6
1. Coal		2
2. Draw slate		5
3. Coal	3	0
Total	3	7
Floor—flint fire-clay.		
Excluded from sample, Nos. 1 and 2.		

ANALYSIS.

Air-dry Loss, 1.2		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.28	3.40	.....	.....
	Volatile matter ..	37.72	37.29	38.60	40.39
	Fixed carbon	55.65	55.01	56.95	59.61
	Ash	4.35	4.30	4.45	.....
		100.00	100.00	100.00	100.00
Sulphur		1.06	1.05	1.09	1.14
Calorific Value Determined	Calories	7749	7660	7930	8300
	B. T. U.....	13948	13788	14274	14940

PERRY COUNTY.

No. 7-b.

Laboratory number 21,360
 Operator.....North Fork Coal Co.
 Mine North Fork
 Location Lennut
 Location in mine.....Face of main entry,
 900 feet from mouth.
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling.....2-25-1915
 Date of analysis 3-24-1915
 Depth below surface 120 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Gray Slate	2	6
1. Coal		2
2. Draw slate		5
3. Coal	3	0
Total	3	7
Floor—flint fire-clay.		
Excluded from sample, Nos. 1 and 2.		

ANALYSIS.

Air-dry Loss, 2.1		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.15	4.23	.....	.....
	Volatile matter ..	39.00	38.17	39.86	41.55
	Fixed carbon	54.85	53.69	56.06	58.45
	Ash	4.00	3.91	4.08	.....
		100.00	100.00	100.00	100.00
Sulphur		0.80	0.78	0.81	0.84
Calorific Value Determined	Calories	7787	7621	7958	8296
	B. T. U.....	14017	13716	14324	14933

PERRY COUNTY.

No. 7-c.

Laboratory number 21,361
 Operator.....North Fork Coal Co.
 Mine North Fork
 Location Lennut
 Location in mine.....Face of room 15
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling.....3-9-1915
 Date of analysis.....3-26-1915
 Depth below surface.....230 feet

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Sandstone		4½
1. Slate		4½
2. Coal		10
3. Hard coal		3½
4. Coal	1	11
5. Flint fire-clay		5
6. Shale		4
7. Coal		4
Total mined above fire-clay.....	3	5
Floor—clay.		
Excluded from sample, No. 1.		

ANALYSIS.

Air-dry Loss, 1.7		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.21	3.85	.....	.....
	Volatile matter ..	37.59	36.96	38.44	40.25
	Fixed carbon	55.80	54.86	57.06	59.75
	Ash	4.40	4.33	4.50	.....
		100.00	100.00	100.00	100.00
Sulphur		0.85	0.84	0.87	0.91
Calorific Value Determined	Calories	7740	7610	7919	8287
	B. T. U.....	13932	13698	14245	14917

PERRY COUNTY.

No. 7-d.

Laboratory number 21,362
 Operator.....North Fork Coal Co.
 Mine North Fork
 Location Lennut
 Location in mine.....Left entry, face of room 18
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling 3-9-1915
 Date of analysis 3-26-1915

SECTION OF MINE.

	Feet	Inches
Roof—Sandstone	30	
Immediate Roof—Slate		7
1. Coal		1
2. Slate		7
3. Coal		10
4. Hard coal		3
5. Coal	1	10
6. Flint fire-clay		5
7. Shale		4
8. Coal		4
Total amount mined above fire-clay.....	3	7
Floor—clay.		
Excluded from sample, Nos. 1 and 2.		

ANALYSIS.

Air-dry Loss, 2.1		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.23	4.32	.....	.....
	Volatile matter ..	37.97	37.16	38.84	40.43
	Fixed carbon	55.95	54.75	57.22	59.57
	Ash	3.85	3.77	3.94	.....
		100.00	100.00	100.00	100.00
Sulphur		0.70	0.69	0.72	0.75
Calorific Value Determined	Calories	7804	7637	7982	8309
	B. T. U.....	14047	13747	14368	14956

PERRY COUNTY.

No. 7-e.

Laboratory number 21,363
 (Composite of 21359-60-61-62.)
 Operator.....North Fork Coal Co.
 Mine North Fork
 Location Lennut
 Coal.....Fire-clay. (Local No. 4)
 Date of sampling.....2-25-1915
 Date of analysis.....3-26-1915

ANALYSIS.

Air-dry Loss, 1.8		Coal Air Dried	Coal as Received	Coal Moisture Free	Coal Moisture and Ash Free
Proximate Analysis	Moisture	2.15	3.88	.....	.....
	Volatile matter ..	37.94	37.26	38.77	40.48
	Fixed carbon	55.78	54.80	57.01	59.52
	Ash	4.13	4.06	4.22	.....
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	5.46	5.56	5.36	5.60
	Carbon	78.17	76.78	79.88	83.40
	Nitrogen	1.77	1.74	1.81	1.89
	Oxygen	9.63	11.03	7.87	8.21
	Sulphur	0.84	0.83	0.86	0.90
	Ash	4.13	4.06	4.22	.....
Calorific Value Determined	Calories	7764	7626	7934	8284
	B. T. U.....	13975	13727	14281	14911
Calorific Value Calculated From Ultimate Analysis	Calories		7663		
	B. T. U.....		13793		

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